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The Mini-Integrated Macroeconomic Model for Poverty Analysis

A Framework for Analyzing the Unemployment and Poverty Effects of Fiscal and Labor Market Reforms

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Abstract

Agénor describes a specialized and less data-intensive version of the Integrated Macroeconomic Model for Poverty Analysis (IMMPA) developed by Agénor, Izquierdo, and Fofack (2003) and Agénor, Fernandes, Haddad, and van der Mensbrugghe (2002). The mini-IMMPA focuses only on the "real" side but it offers a more detailed treatment of the labor market (by accounting, for instance, for public education, employment subsidies, and job security provisions) and the tax structure. Simulations of a cut in payroll taxes on unskilled labor show the importance of accounting for the fiscal implications of labor market reforms when assessing their effects on unemployment and poverty.

This paper—a product of the Poverty Reduction and Economic Management Division, World Bank Institute—is part of a larger effort in the institute to analyze the interactions between micro and macro factors in the design of poverty reduction strategies. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Maria Gosiengfiao, room J4-280, telephone 202-473-3363, fax 202-676-9810, email address mgosiengfiao@worldbank.org. Policy Research Working Papers are also posted on the Web at http://econ.worldbank.org.
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1 Introduction

Fiscal and labor market reforms are at the forefront of the policy agenda in many developing countries, and assessing their effects on unemployment and poverty is a key issue in the design and sequencing of adjustment programs. In turn, assessing these effects requires understanding not only how the labor market operates, but also how fiscal variables (taxes and expenditure) interact with the labor market. Because most taxes have an effect on the functioning of the economy, they also affect the labor market, both directly and indirectly, through changes in the level and distribution of wages, labor supply decisions, and the level and composition of employment. For instance, taxing the profits of small firms (which tend to be more labor intensive) may affect their ability to create jobs, whereas income taxation and the existence of an unemployment benefit system may affect the propensity of the unemployed to seek employment. Payroll taxes (such as employers' social security contributions) raise the effective cost of labor over and above the wage paid, thereby affecting the demand for labor, whereas income taxes and employees' social security contributions reduce the return to being employed, thereby affecting the decision to enter (or remain in) the labor force and possibly to invest in the acquisition of skills.[1] In addition to influencing the decision to enter into (or exit from) the labor force, changes in taxation may also affect the decision to engage in part-time work. Similarly, taxes on goods and services may affect the purchasing power of wages, and thus the decision to seek formal employment. High tax rates on income and activities in the formal economy may also drive firms underground, thereby impeding an efficient allocation of resources, with adverse effects on employment and poverty. Indeed, as shown in Figure 1, in developing economies the overall tax ratio (in proportion of GDP), as well as the direct income tax ratio, seem to be positively correlated with the size of the informal economy, and thus with "disguised" unemployment.[2] To the extent that the urban

[1] As is well known, changes in income taxes affect labor supply and leisure choices through both substitution and income effects. Because these effects tend generally to operate in opposite direction, the net effect of a change in the income tax on the supply of labor is *a priori* ambiguous.

[2] At a more formal level, Loayza (1996), Johnson, Kaufman, and Zoido-Lobaton (1998), Schneider and Enste (2000), Ihrig and Moe (2000) and Dessy and Pallage (2003), have also found that a higher tax burden tends to be correlated with a larger informal sector. By contrast, there does not appear to be a simple correlation between the overall tax ratio and open unemployment.

poor tend to be concentrated in the informal sector (as illustrated in Figure 2), taxation could be positively correlated with poverty. But of course, the taxation-poverty correlation could also be weak or non existent, because it also depends on the use of tax proceeds—namely, whether taxes serve to finance expenditure on the poor, public spending on infrastructure (which indirectly affect the poor through a complementarity effect on private investment and thus labor demand), or are simply wasted on inefficient projects.

Labor market distortions, and the links between taxation and the labor market, have received limited attention in quantitative, general equilibrium models that have often been used for development policy analysis. The purpose of this paper is to present a quantitative framework that account for many of these distortions and linkages, and that modelers and policy economists in developing countries can use to assess the effects of fiscal and labor market reforms on unemployment and poverty. This framework, called Mini-IMMPA, is a specialized, and less-data intensive, version of the Integrated Macroeconomic Model for Poverty Analysis (IMMPA) developed by Agénor, Izquierdo and Fofack (2003), and Agénor, Fernandes, Haddad and van der Mensbrugghe (2003). Although Mini-IMMPA focuses only on the "real" side, it offers a more detailed treatment of the labor market than IMMPA (by accounting for features such as bilateral wage bargaining, free public education, employment subsidies, and job security provisions) and the tax structure. The resulting framework allows the user to analyze a variety of important policy issues, such as for instance the trade-offs involved in shifting the tax burden away from unskilled labor in the formal sector and toward other tax bases.

The remainder of the paper is organized as follows. The next section describes in detail the structure of Mini-IMMPA, considering in turn the production structure, the labor market, supply and demand of commodities, external trade, prices, profits and income, private consumption and savings, private investment, the public sector, and the balance of payments. The description of the labor is particularly detailed, given the importance of government-induced labor market distortions in developing countries. I account, in particular, for the existence of firing costs in the formal sector. Such costs tend to benefit the employed (or "insiders") by lowering their probability of losing their job and increasing their bargaining power in wage determination, and to make firms reluctant to both hire and fire workers, thereby raising the duration (if not the level) of unemployment (Lindbeck and Snower (2001)). Section III presents and discusses the results of two

policy simulations: a cut in the minimum wage, and a reduction in payroll taxes on unskilled labor (assuming both neutral and non-neutral revenue effects). The payroll tax experiment is of particular interest in light of the previous discussion emphasizing the links between fiscal and labor market reforms. As it turns out, the unemployment and poverty effects of this policy change depend importantly on whether or not it is offset by other changes in sources of revenue, and what the precise nature of that source is. The last section summarizes the main results of the analysis and suggests various extensions. Appendices A, B and C provide a summary list of the model's equations, variable names and parameters, as well as a description of the calibration procedure.

2 Structure of Mini-IMMPA

The building blocks of the "structural" components of mini-IMMPA consist of the production structure, the labor market, the supply and demand for goods and services, external trade, sectoral and aggregate prices, profits and income formation, private consumption and savings, private investment, the public sector, and the balance of payments. The link between the structural component and a (fictitious) household income and expenditure survey, which is necessary for poverty and distributional analysis, is also explained later on.

2.1 Production

The basic distinction on the production side is that between rural and urban sectors. In the rural economy (or agriculture) firms produces one good (referred to as good 1), which is sold domestically or exported. The urban economy consists of both formal and informal components. The informal economy produces nontraded services (referred to as good 2). in the formal urban economy production consists of a private good (referred to as good 3) and a nontraded public good (referred to as good 4).

2.1.1 Rural Production

Land available for rural activities is assumed to be non marketed and in fixed supply. Gross output of the agricultural good, X_1, is the sum of value added,

V_1, and intermediate consumption:

$$X_1 = V_1 + \sum_{i=1}^{4} a_{i1} X_1, \tag{1}$$

where the a_{ij} are input-output coefficients measuring relative sales from sector i to sector j.

Value added is produced with a Cobb-Douglas function of land and a composite factor, defined as a constant elasticity of substitution (CES) function of the number of unskilled workers employed in the sector, U_1, and the economy-wide stock of public physical capital (K_G, defined below). Normalizing the area of land allocated to production to unity yields

$$V_1 = \left[\alpha_{X_1}\{\beta_{X_1} U_1^{-\rho_{X_1}} + (1-\beta_{X_1}) K_G^{-\rho_{X_1}}\}^{-\frac{1}{\rho_{X_1}}}\right]^{1-\eta_{X_1}}, \tag{2}$$

where $0 < \eta_{X_1} < 1$, and the other parameters have the standard interpretation. Given the Cobb-Douglas specification, agricultural production exhibits decreasing returns to scale in the composite input. The presence of K_G in (2) is based on the view that a greater availability of public physical capital in the economy (roads, power plants, and the like) improves the productivity of all production units in the rural sector, because it facilitates not only trade but also production itself.

Firms in the rural sector allocate their output to exports, E_1, or the domestic market, D_1, according to a constant elasticity of transformation (CET) function:

$$X_1 = \alpha_{ED_1}[\beta_{ED_1} E_1^{\rho_{ED_1}} + (1-\beta_{ED_1}) D_1^{\rho_{ED_1}})]^{\frac{1}{\rho_{ED_1}}}, \tag{3}$$

with the ratio ratio E_1/D_1 depending, as shown below, on the relative prices of exported and domestic goods.

2.1.2 Urban Informal Production

Gross production in the urban informal sector, X_2, is given also as the sum of value added, V_2, and intermediate consumption:

$$X_2 = V_2 + \sum_{i=1}^{4} a_{i2} X_2. \tag{4}$$

There is no physical capital in the informal sector, and production requires only unskilled labor. Assuming decreasing returns to scale, value added can thus be written solely as a function of the number of unskilled workers employed in the informal economy, U_2:

$$V_2 = U_2^{\eta_{X_2}}, \qquad 0 < \eta_{X_2} < 1. \tag{5}$$

From (5), the demand for labor in the informal sector is given by

$$U_2^d = \eta_{X_2}(V_2/\omega_2), \tag{6}$$

where $\omega_2 = W_2/PV_2$ is the product wage, with W_2 the nominal wage and PV_2 the price of value added in the informal sector (defined below).

2.1.3 Urban Formal Private Production

Gross production of the private formal urban sector, X_3, is once again taken to be given by the sum of value added, V_3, and intermediate consumption:

$$X_3 = V_3 + \sum_i^4 a_{i3} X_3. \tag{7}$$

Private formal production uses as inputs both skilled and unskilled labor, as well as physical capital. Skilled labor and private physical capital are assumed, in line with the evidence discussed in Agénor (2000) and Hamermesh (1993), to have a higher degree of complementarity—that is, a lower degree of substitution—than physical capital and unskilled labor. In order to account for these differences in the degree of substitutability among inputs, a nested CES production structure is adopted. Specifically, at the lowest level of factor combination, skilled labor, S_3, and private physical capital, K_3, are combined to form the composite input J_L, with a relatively low elasticity of substitution (as measured by $\sigma_{X_3L} = 1/(1 + \rho_{X_3L})$) between them:

$$J_L(S_3, K_3) = \alpha_{X_3L}[\beta_{X_3L} S_3^{-\rho_{X_3L}} + (1 - \beta_{X_3L}) K_3^{-\rho_{X_3L}}]^{-\frac{1}{\rho_{X_3L}}}. \tag{8}$$

At the second level, this composite input is used together with unskilled labor, U_3, to form the composite input J_H:

$$J_H(J_L, U_3) = \alpha_{X_3H}\{\beta_{X_3H} J_L^{-\rho_{X_3H}} + (1 - \beta_{X_3H}) U_3^{-\rho_{X_3H}}\}^{-\frac{1}{\rho_{X_3H}}}. \tag{9}$$

The elasticity of substitution between J_L and unskilled workers, measured by $\sigma_{X_3H} = 1/(1+\rho_{X_3H})$, is taken to be higher than between S_3 and K_3, that is

$$\sigma_{X_3H} > \sigma_{X_3H}.$$

The final layer combines J_H and K_G (the stock of government capital) as production inputs, with public capital subject to congestion effects:

$$V_3(J_H, K_G) = \alpha_{X_3}\left[\beta_{X_3} J_H^{-\rho_{X_3}} + (1-\beta_{X_3})\{\frac{K_G}{URB^{dc_3}}\}^{-\rho_{X_3}}\right]^{-\frac{1}{\rho_{X_3}}}, \qquad (10)$$

where URB is the size of the urban population (defined below), and $dc_3 \geq 0$. The presence of the term K_G/URB in this equation can be explained as follows (see Agénor (2003*b*)). As in agriculture, public physical capital has a positive impact on the productivity of production factors in the urban private sector. However, this positive effect is now subject to *congestion* effects. As long as $dc_3 > 0$, the positive externality of public capital decreases as its usage by the urban population increases, that is, the larger the size of the urban population, the lower is the contribution of the public capital stock to private urban production.

Private firms in the urban formal sector allocate their output to exports, E_3, or the domestic market, D_3, according to a production possibility frontier, again defined by a CET function:

$$X_3 = \alpha_{ED_3}[\beta_{ED_3} E_3^{\rho_{ED_3}} + (1-\beta_{ED_3}) D_3^{\rho_{ED_3}}]^{\frac{1}{\rho_{ED_3}}}. \qquad (11)$$

As shown later, the ratio E_3/D_3 depends on the relative prices of exported and domestic goods.

2.1.4 Production of the public good

Gross production of the public good, X_4, is given by the sum of value added, V_4, and intermediate consumption:

$$X_4 = V_4 + \sum_{i=1}^{4} a_{i4} X_4. \qquad (12)$$

Value added in the public sector is measured by the government wage bill, as in national accounts:

$$V_4 = (W_{UG}U_4 + W_{SG}S_4)/PV_4. \tag{13}$$

where S_4 and U_4 (respectively W_{SG} and W_{UG}) denote employment levels (respectively wages) of skilled and unskilled workers in government. Employment levels are treated as predetermined policy variables, whereas wage formation is discussed below.

2.2 The Labor Market

As noted earlier, there are two categories of workers in the economy, skilled and unskilled. Unskilled workers may be employed either in the rural economy or in the urban economy, whereas skilled workers are employed only in the urban economy. As discussed later, skilled workers have a high reservation wage and therefore do not seek employment in the informal economy, even when they are unable to find a job in the formal sector.

In addition to accounting for various sources of labor market segmentation (a pervasive feature of the labor market in developing countries), Mini-IMMPA accounts for the existence of employment protection regulations, an important component of which being state-mandated firing costs. Indeed, in many of developing countries, severance payments tend to be a partial substitute to unemployment insurance benefits. An important issue is whether these costs contribute to a high level of unemployment and to its degree of persistence—perhaps by reducing employment variation over the business cycle, as argued by Bertola (1990).[3] A general conclusion of the literature is that firing costs affect employment dynamics more than the average level of employment; unemployment tends to be more persistent in countries characterized by high job security provisions, because mandatory firing costs play a stabilizing effect on aggregate employment. On the one hand, firing costs

[3]Bertola's analysis assumes that workers are risk-neutral. But as noted by Booth (1999), typically most workers derive their income from employment, and it is difficult for most of them to diversify across jobs; it seems therefore more plausible to assume that workers are risk averse. She also considers the case in which firms and workers bargain about both wages and the size of redundancy payments. However, these modifications do not change Bertola's main result, which is that firing costs tend to stabilize employment over the business cycle.

prevent workers from losing their jobs (thereby preventing the loss of firm-specific human capital if downturns are temporary); but on the other, they discourage new hires.[4] They also tend to increase the incidence of temporary employment contracts, as noted by Betcherman, Luinstra, and Ogawa (2001), Heckman and Pagés (2000), and Lindauer (1999).[5] In what follows the effect of firing costs on both employment and wage formation is captured under the assumption that workers (or the trade union that represents them) internalize, while bargaining with employers, the value of the severance payment that they would receive in the event of dismissal.

2.2.1 Rural Wages and Employment

The demand for labor in agriculture, U_1^d, is derived in standard fashion from the first-order condition for profit maximization and is given by

$$U_1^d = \left\{ V_1^{1+\frac{\rho_{X_1}}{1-\eta_{X_1}}} \frac{1-\eta_{X_1}}{\omega_1} \cdot \frac{\beta_{X_1}}{\alpha_{X_1}^{\rho_{X_1}}} \right\}^{\frac{1}{1+\rho_{X_1}}} \tag{14}$$

where $\omega_1 = W_1/PV_1$ is the product wage in agriculture, W_1 the nominal wage, and PV_1 the net output price (determined below).

The nominal wage in agriculture, W_1, adjusts to clear the labor market. With U_R^s representing labor supply in agriculture, the equilibrium condition of the labor market is thus given by

$$U_R^s = U_1^d(V_1, \frac{W_1}{PV_1}). \tag{15}$$

The supply of labor in the rural sector is predetermined at any given point in time, but grows over time at the exogenous rural population growth rate, g_R, net of worker migration to urban areas, MIG:

$$U_R^s = U_{R,-1}^s(1+g_R) - MIG. \tag{16}$$

[4] As shown by Gavin (1986), the impact of firing costs on labor demand depends not only on the size of the required severance payments and the wage elasticity of labor demand, but also on the variability and persistence of shocks to labor demand, and the firm's discount rate.

[5] For some evidence on the effects of job security regulations, see Fallon and Lucas (1993), Kugler (2000), Dabalen (2002), and Besley and Burgess (2002).

Following Harris and Todaro (1970), the incentives to migrate are taken to depend negatively on the ratio of the average expected *consumption* wage in rural areas to that prevailing in urban areas. Unskilled workers in the urban economy may be employed either in the private formal sector, in which case they are paid a minimum wage, W_M, or they can enter the informal economy and receive the average income in that sector (before transfers), y_2^m.[6] When rural workers make the decision to migrate to urban areas, they are uncertain as to which type of job they will be able to get, and therefore weigh wages in each sector by the probability of finding a job in that sector. These probabilities are approximated by prevailing employment ratios. Finally, potential migrants also consider what their expected purchasing power in rural and urban areas is likely to be, depending on whether they stay in the rural sector and consume the "typical" basket of goods of rural households, or migrate and consume the "typical" urban basket of goods.

The expected, unskilled urban real wage, w_U^e, is thus a weighted average of the minimum wage in the formal sector and the going wage in the informal sector, deflated by the urban consumption price index for unskilled workers, P_{UU} (defined below):

$$w_U^e = \frac{\theta_U W_{M,-1} + (1-\theta_U) y_{2,-1}^m}{P_{UU,-1}}, \tag{17}$$

where θ_U is the probability of finding a job in the urban formal sector, measured by the proportion of unskilled workers in the private formal sector, relative to the total number of unskilled urban workers (net of government employment) looking for a job, $U_F^s - U_4$, in the previous period:

$$\theta_U = \frac{U_{3,-1}}{U_{F,-1}^s - U_{4,-1}}. \tag{18}$$

A similar reasoning is used to calculate the expected rural consumption real wage, w_A^e. Here the employment probability is equal to unity, because workers can always find a job at the going wage. Assuming a one-period lag yields

$$w_A^e = \frac{W_{1,-1}}{P_{R,-1}},$$

[6] As discussed below, there is no job turnover for either category of workers in the public sector. Given that, as discussed below, households in the informal sector receive all profits from production, average income is a better measure of expected income in that sector than the going wage.

where P_R is the rural consumption price index (defined below).

The migration function is therefore specified as

$$\frac{MIG}{U_{R,-1}} = \left(\frac{w_U^e}{w_A^e}\right)^{\sigma_M}, \tag{19}$$

where $\sigma_M > 0$ measures the elasticity of (relative) migration flows with respect to expected wages. Note that the evidence suggests that there are several factors, in addition to wage differentials, that affect rural-to-urban migration. The family, in particular, appears to play a particularly important role in explaining migration by individuals (Lucas (1997)) as well as cash-seeking behavior, which translates into a positive impact of the *composition* or rural income, in addition to its level (Velenchik (1994)). Moreover, if workers are risk averse, they may require a greater wage premium for urban employment than the one implied by the observed wage differential, to compensate them for the risk of being unemployed. However, some of these considerations are difficult to integrate in the type of models considered here.

2.2.2 Urban Unskilled Wages, Employment, and Unemployment

Both the government and private firms in the formal and informal urban sectors use unskilled labor in production. The public sector hires an exogenous level of unskilled workers, U_4, at the nominal wage W_{UG}, whereas the demand for unskilled labor by the formal private sector is determined by firms' profit maximization subject to the given minimum wage, W_M.[7] Both W_{UG} and W_M are assumed to be indexed on the price of the consumption basket for urban unskilled households, P_{UU} (defined below):

$$W_i = \omega_i P_{UU}^{idx_i}, \quad i = UG, M, \tag{20}$$

where ω_i is the real wage and $0 \leq idx_i \leq 1$ the indexation parameter. In order to avoid corner solutions, the wage rate paid to unskilled labor in the formal urban sector is assumed to be systematically greater than the wage rate paid in the informal sector. Consequently, unskilled workers in the urban area will always seek employment in the private formal sector first.

[7] The assumption that the minimum wage is binding in the formal sector is actually a source of debate; see for instance Dabalen (2000) for a review of the evidence for sub-Saharan Africa. However, what is needed is that the distribution of unskilled wages shifts as a result of a change in the minimum wage.

Firms also pay a payroll tax, at the rate $0 < ptx_U < 1$ for unskilled workers, which is proportional to the wage bill, $W_M U_3$; and they receive a nominal employment subsidy on unskilled labor of $ES_U \leq W_M$ per worker. Using (9), unskilled labor demand by the private sector is thus given by

$$U_3^d = J_H \left(\frac{P_H^J}{(1+ptx_U)W_M - ES_U} \cdot \frac{\beta_{X_3H}}{\alpha_{X_3H}^{\rho_{X_3H}}} \right)^{\sigma_{X_3H}} . \tag{21}$$

In addition, mobility of the unskilled labor force between the formal and the informal sectors is assumed to be imperfect and determined by expected income opportunities. Specifically, the total supply of unskilled workers in the formal sector (including public sector workers), U_F^s, is taken to change over time as a function of the expected wage differential across sectors. Wage and employment prospects are formed on the basis of prevailing conditions in the labor market. Because there is no job turnover in the public sector, the expected real wage in the formal economy, w_F^e, is equal to the real minimum wage (measured in terms of the price of the consumption basket for unskilled workers) weighted by the probability of being hired in the private sector. Assuming that hiring in that sector is random, this probability can be approximated by the ratio of employed workers to those seeking employment. Assuming a one-period lag,

$$w_F^e = \frac{U_{3,-1}^d}{U_{F,-1}^s - U_{3,-1}} \left(\frac{W_{M,-1}}{P_{UU,-1}} \right).$$

The expected real wage in the informal economy is simply the average real income in that sector (measured again in terms of the relevant consumption price index), because there are no barriers to entry in that sector. Assuming again a one-period lag,

$$w_I^e = \frac{y_{2,-1}^m}{P_{UU,-1}}.$$

The flow supply of unskilled workers in the formal sector thus evolves over time according to

$$\frac{U_F^s}{U_{F,-1}^s} = \left(\frac{w_F^e}{P_{UU,-1}^{-1} y_{2,-1}^m} \right)^{\sigma_F}, \quad \sigma_F > 0, \tag{22}$$

where σ_F denotes the elasticity of labor flows with respect to the (expected) wage ratio. The rate of unskilled unemployment in the formal sector, UNE_U, is thus given by

$$UNE_U = 1 - \frac{(U_3^d + U_4)}{U_F^s}, \tag{23}$$

where $U_3^d + U_4$ is total unskilled formal employment.

The supply of labor in the informal economy, U_2^s, is given by

$$U_2^s = U_U^s - U_F^s. \tag{24}$$

The informal labor market clears continuously, so that $U_2^d = U_2^s$. From this condition and equation (6), the equilibrium nominal wage is thus given by

$$W_2 = \eta_{X_2}(\frac{PV_2V_2}{U_2^s}) = \eta_{X_2} y_2^m, \tag{25}$$

where y_2^m is average income (before transfers) in the informal economy.

The supply of unskilled labor in the urban sector, U_U^s, grows as a result of "natural" urban population growth and migration of unskilled labor from the rural economy, as discussed earlier. Moreover, some urban unskilled workers, SKL, acquire skills and leave the unskilled labor force to augment the supply of qualified labor. All individuals are born unskilled, and thus natural urban population growth (not resulting from migration or skills acquisition factors) is represented by urban unskilled population growth only, at the exogenous rate g_U. Thus, the urban unskilled labor supply evolves according to

$$U_U^s = U_{U,-1}^s(1 + g_U) + MIG - SKL. \tag{26}$$

2.2.3 Urban Skilled Wages and Employment

As noted earlier, the employment levels of both skilled and unskilled workers in the public (urban) sector are taken as exogenous; the lack of turnover is in part due to the fact that working for the government provides a nonpecuniary benefit, which takes the form of greater job security. The real wage rate that skilled workers receive in the public sector, ω_{SG}, is also taken as given. With W_{SG} denoting the nominal wage, and P_{US} the consumption price index for urban skilled workers (defined below), full indexation therefore implies that

$$W_{SG} = \omega_{SG} P_{US}. \tag{27}$$

From (8), the demand for skilled labor is, noting that $\rho_{X_3L}\sigma_{X_3L} = 1 - \sigma_{X_3L}$:

$$S_3^d = \left\{\frac{P_L^J J_L}{W_S}\beta_{X_3L}\right\}^{\sigma_{X_3L}} \left\{\frac{J_L}{\alpha_{X_3L}}\right\}^{1-\sigma_{X_3L}} = J_L \left\{\frac{P_L^J}{W_S} \cdot \frac{\beta_{X_3L}}{\alpha_{X_3L}^{\rho_{X_3L}}}\right\}^{\sigma_{X_3L}}. \quad (28)$$

Two alternative specifications are used for determining wages for skilled labor in the private sector, W_S. The first approach is based on the "monopoly union" framework, and is derived as follows (see, for instance, Agénor (1999), Devarajan, Ghanem, and Thierfelder (1997), and Thierfelder and Shiells (1997)). Let ω_S^c denote the *consumption* real wage, that is, the nominal wage earned by skilled workers deflated by the cost-of-living index that these workers face in the urban sector, P_{US}. A centralized labor union sets ω_S^c with the objective to maximize a utility function that depends on deviations of both employment and the consumption wage from their target levels, subject to the firm's labor demand schedule.[8] Specifically, the union's utility function is given by

$$U = (\omega_S^c - \omega_S^{cT})^\nu (S_3^d - S_3^T)^{1-\nu}, \quad 0 < \nu < 1,$$

where S_3^d is given by equation (28). The quantities ω_S^{cT} and S_3^T measure the union's wage and employment targets, respectively, and are both assumed predetermined with respect to ω_S^c. The parameter ν reflects the relative importance that the union attaches to wage deviations from target, as opposed to employment deviations. The union's problem is thus

$$\max_{\omega_S^c} U = (\omega_S^c - \omega_S^{cT})^\nu (S_3^d - S_3^T)^{1-\nu}.$$

[8] Alternatively, one could assume that firms and the union bargain over wages (through a generalized Nash bargaining process), with either firms determining employment (the so-called "right to manage" approach) or that firms and the union bargain over *both* wages and employment. In the former case, the firm and the union would determine ω_S by maximization of the product of each party's gains from reaching a bargain, weighted by their respective bargaining strengths, and once wages are set, employment would be determined by the firm. As shown by Creedy and McDonald (1991), for wage determination, it does not make much difference whether bargaining is over wages only, or over wages and employment. However, as is well known (see for instance Booth (1995)), the equilibrium outcome in the case of bargaining over both wages and employment is such that firms would not in general be on their labor demand schedule.

Using (28), the first-order condition is given by

$$\nu\left\{\frac{S_3^d - S_3^T}{\omega_S^c - \omega_S^{cT}}\right\}^{1-\nu} - (1-\nu)\left\{\frac{S_3^d - S_3^T}{\omega_S^c - \omega_S^{cT}}\right\}^{-\nu} \sigma_{X_3L}\left(\frac{S_3^d}{\omega_S^c}\right) = 0,$$

or equivalently

$$\nu\left\{\frac{S_3^d - S_3^T}{\omega_S^c - \omega_S^{cT}}\right\} - \frac{(1-\nu)\sigma_{X_3L}S_3^d}{\omega_S^c} = 0.$$

Solving this condition yields

$$\frac{\omega_S^c - \omega_S^{cT}}{\omega_S^c} = \frac{\nu}{(1-\nu)\sigma_{X_3L}}\left(\frac{S_3^d - S_3^T}{S_3^d}\right),$$

which indicates that percentage deviations of the optimal wage from its target value are linearly related to percentage differences of employment from its target level.

The union's target real wage, ω_S^{cT}, is assumed to be related positively to skilled wages in the public sector (measured in terms of the relevant price index), ω_{SG}, and negatively to the skilled unemployment rate, UNE_S, and the real firing cost per skilled worker, f_S, measured in terms of the price of valued added in the private formal sector, PV_3 (defined below). Wage-setting in the public sector is assumed to play a signaling role for wage setters in the rest of the economy. When unemployment is high, the probability of finding a job (at any given wage) is low. Consequently, the higher the unemployment rate, the greater the incentive for the union to moderate its wage demands in order to induce firms to increase employment. As noted earlier, firing costs do prevent excessive job losses in bad times (thereby preventing the loss of firm-specific human capital if downturns are temporary) but they also discourage new hires—namely because reversing mismatches is costly if workers prove to be inadequate matches with their job requirements. The union internalizes the disincentive effect of severance payments on labor demand. As a result, the higher the firing cost, the greater the incentive for the union to reduce its wage demands, in order to encourage firms to hire. Normalizing the target level of employment to zero ($S_3^T = 0$) the above expression can thus be rewritten as

$$W_S = P_{US}\frac{UNE_S^{-\phi_1} f_S^{-\phi_2} \omega_{SG}^{\phi_3}}{1 - \nu/(1-\nu)\sigma_{X_3L}}, \tag{29}$$

where UNE_S is defined below and the ϕ_i coefficients are all positive. This equation implies, in particular, that a higher level of unemployment lowers the *level* of wages, as predicted by various efficiency wage theories.[9]

The second approach to determining skilled wages assumes direct bargaining, in each period, between producers and workers over the product wage, $\omega_S = W_S/P_L^J$. If a bargain is reached, each worker receives $\omega_S = W_S/PJ_L$, whereas the producer receives $m_S - \omega_S$, where $m_S = \partial J_L(S_3, K_3)/\partial S_3$ is the marginal product of the worker, given by (using equation (8)):

$$m_S = (\frac{\beta_{X_3L}}{\alpha_{X_3L}^{\rho_{X_3L}}})(\frac{J_L}{S_3})^{1+\rho_{X_3L}}. \tag{30}$$

The worker's "fallback" position is denoted Ω_S, which may represent an unemployment benefit (if one exists). The firm's fallback position is assumed to depend on firing costs in the following way (see Coe and Snower (1997)). In case of bargaining disagreement, the worker engages in industrial action that is costly to the firm (but not to himself). The greater is the level of industrial action, the lower will be the producer's fallback position and thus the higher will be the wage that the worker can achieve, up to a limit, beyond which the firm has an incentive to fire him. Producers face a firing cost of f_S per worker (measured now in terms of the price of the composite output J_L, that is, P_L^J), and for simplicity all workers become eligible for severance payments immediately upon hiring.[10] If the cost of the industrial action to the firm exceeds the firing cost f_S, the worker will be replaced by another one. Consequently, the worker will set the level of industrial action so that its cost to the firm is exactly f_S, making the firm indifferent between retaining him and replacing him.

Thus, the worker's bargaining surplus is $\omega_S - \Omega_S$, whereas the firm's bargaining surplus is $m_S - (\omega_S + f_S)$. The Nash bargaining problem can be formulated as

$$\max_{\omega_S}(\omega_S - \Omega_S)^{\nu}[m_S - (\omega_S + f_S)]^{1-\nu}, \quad 0 < \nu < 1,$$

[9]Note that, in general, on would expect the optimal wage to be also be an increasing function of union density. Here, it is implicitly assumed that all skilled workers are members of the union. In addition, note that the target wage could also be specified as increasing in the income tax rate, itx_S, implying that the union would demand higher wages to compensate for a decrease in after-tax income.

[10]In practice, redundancy payments are only made to workers with some minimum period of continuous service with the firm.

where ν measures the bargaining strength of the worker relative to the firm. The first-order condition is given by

$$\nu \left\{ \frac{m_S - (\omega_S + f_S)}{\omega_S - \Omega_S} \right\}^{1-\nu} - (1-\nu) \left\{ \frac{m_S - (\omega_S + f_S)}{\omega_S - \Omega_S} \right\}^{-\nu} = 0,$$

that is,

$$\nu \frac{m_S - (\omega_S + f_S)}{\omega_S - \Omega_S} - (1-\nu) = 0.$$

From this equation, the equilibrium negotiated wage can be derived as

$$\omega_S = \nu(m_S - f_S) + (1-\nu)\Omega_S.$$

Suppose that there is no unemployment benefit, so that $\Omega_S = 0$, and that the bargaining strength of a skilled worker, ν, varies inversely with the rate of skilled unemployment, UNE_S. The wage-setting equation can thus be written as[11]

$$W_S = P_L^J UNE_S^{-\phi_1}(m_S - f_S), \tag{31}$$

which implies again that the level of wages and the rate of unemployment are inversely related, and that an increase in the firing cost reduces the skilled wage.

The skilled open unemployment rate, UNE_S, is given by the ratio of skilled workers who are not employed either by the private or the public sector, divided by the total population of skilled workers:

$$UNE_S = 1 - \frac{(S_3^d + S_G)}{S}, \tag{32}$$

where S_G is the *total* number of skilled workers in the public sector, engaged in both the production of public services, S_4, and education, S_G^E (see below):

$$S_G = S_4 + S_G^E. \tag{33}$$

Skilled workers who are unable to find a job in the formal economy opt to remain openly unemployed, instead of entering the informal economy (in contrast to unskilled workers), as a result of either a reservation wage that systematically exceeds the informal sector wage, or concerns about adverse

[11] With an unemployment benefit proportional to the wage, so that $\Omega_S = \omega_S$, the coefficient ν in the negotiated wage should be replaced by $\nu/[1-(1-\mu)\iota]$.

signaling effects to potential future employers, as argued in a different setting by McCormick (1990) and Gottfries and McCormick (1995).

The evolution of the skilled labor force depends on the rate at which unskilled workers acquire skills:

$$S = (1 - \delta_S)S_{-1} + SKL, \tag{34}$$

where $0 < \delta_S < 1$ is the rate of depreciation, or "de-skilling", of the skilled labor force. The size of the urban population, URB, is thus

$$URB = U_U^s + S,$$

that is, using (26) and (34):

$$URB = (1 + g_U)U_{U,-1}^s + MIG + (1 - \delta_S)S_{-1}. \tag{35}$$

2.2.4 Skills Formation

The acquisition of skills by unskilled workers takes place through an education system operated (free of charge) by the public sector. Specifically, the flow of unskilled workers who become skilled, SKL, is taken to be a CES function of the "effective" number of teachers in the public sector, S_G^E, and the government stock of capital in education, K_E (defined below):

$$SKL = [\beta_E(\varphi S_G^E)^{-\rho_E} + (1 - \beta_E){K_E}^{-\rho_E}]^{-\frac{1}{\rho_E}}, \tag{36}$$

where φ measures the productivity of public workers engaged in providing education. φ is assumed to depend on the relative wage of skilled workers in the public sector, W_{SG}, relative to the expected wage for that same category of labor in the private sector, which (in the absence of unemployment benefits) is given by one minus the unemployment rate, $1 - UNE_S$, times the going wage, W_S.[12] Assuming a simple logistic form (as for instance in Maechler and Roland-Holst (1997, p. 492)), and a one-period lag, this function can be written as[13]

[12] For simplicity, it is assumed that all skilled workers in the public sector earn the same nominal wage.

[13] Wages in equations (37) and (38) are specified in nominal terms, because they are assumed to be both deflated by the same price index—the price of the consumption basket for skilled workers in the urban sector.

$$\varphi = \left\{1 + \kappa \exp\left[-\frac{(1 - UNE_{S,-1})W_{S,-1}}{W_{SG,-1}}\right]\right\}^{-1}, \qquad \kappa > 0. \tag{37}$$

This equation shows that the higher the public sector wage relative to its opportunity cost, the greater the level of effort by teachers in the public sector, and thus the greater the number of skilled workers produced by the system. Alternatively, the effort function derived by Agénor and Aizenman (1999) could also be used:

$$\varphi = 1 - \varphi_m \left[\frac{(1 - UNE_{S,-1})W_{S,-1}}{W_{SG,-1}}\right]^{\kappa}, \qquad \kappa > 0, \tag{38}$$

and where $0 < \varphi_m < 1$ denotes the "minimum" level of effort.

2.3 Supply and Demand

Both the informal and public sector goods are nontradables, and both markets clear continuously. In each sector, total supply is thus equal to gross production, that is, $X_2 = Q_2^s$ and $X_4 = Q_4^s$.

Rural and private formal urban goods, by contrast, compete with imported goods. The supply of the composite good for each of these sectors, Q_1^s and Q_3^s, consists of a CES combination of imports and domestically produced goods:

$$Q_1^s = \alpha_{Q_1}\{\beta_{Q_1} M_1^{-\rho_{Q_1}} + (1 - \beta_{Q_1}) D_1^{-\rho_{Q_1}}\}^{-\frac{1}{\rho_{Q_1}}}, \tag{39}$$

$$Q_3^s = \alpha_{Q_3}\{\beta_{Q_3} M_3^{-\rho_{Q_3}} + (1 - \beta_{Q_3})(D_3^s)^{-\rho_{Q_3}}\}^{-\frac{1}{\rho_{Q_3}}}. \tag{40}$$

Aggregate demand in each sector consists of intermediate and final consumption, government spending, and investment demand:

$$Q_i^d = C_i + INT_i, \quad \text{for } i = 1, 2, 4 \tag{41}$$

$$Q_3^d = C_3 + G_3 + Z_3 + INT_3, \tag{42}$$

where INT_j is defined as total demand (by all productions sectors) for intermediate consumption of good j:

$$INT_j = \sum_i a_{ji} X_i \qquad \text{for } j = 1, ...4. \tag{43}$$

For the agricultural, public and informal sector goods, aggregate demand consists of intermediate consumption and private final consumption (C_1, C_2, and C_4). Aggregate demand for the private formal good consists of intermediate consumption, final consumption by households and the public sector, C_3 and G_3, and private investment, Z_3.

Other current government spending on goods, G_C, and public investment expenditure, Z_G (that is, total government expenditure minus salaries, transfers, subsidies and interest payments) is spent only on the private formal sector good, so that G_3 is equal to

$$G_3 = G_C + Z_G. \tag{44}$$

Each category of household h determines final consumption for each type of good i, C_{ih}, so as to maximize a Stone-Geary utility function, U_h, which takes the form

$$U_h = \sum_{i=1}^{4} (C_{ih} - PC_i x_{ih})^{cc_{ih}},$$

where x_{ih} is real autonomous consumption of good i by household h, the coefficients cc_{ih} are the marginal budget shares of good i in total consumption expenditure by household h, C_h, and PC_i is the actual sales price of good i (defined below). These shares satisfy the standard restrictions

$$0 \leq cc_{ih} \leq 1, \ \forall i, h \ \text{ and } \ \sum_{i=1}^{4} cc_{ih} = 1.$$

Maximization of the utility function U_h subject to household h's budget constraint $\sum_{i=1}^{4} C_{ih} - CO_h = 0$ yields the familiar demand functions

$$C_{ih} = x_{ih} + \frac{cc_{ih}(CO_h - \sum_{i=1}^{4} PC_i x_{ih})}{PC_i}. \tag{45}$$

Total final private consumption for each production sector i, C_i, is the summation across all categories of households of consumption of good i:

$$C_i = \sum_{h=1}^{n} C_{ih}. \tag{46}$$

Total private investment, Z_P, consists of purchases of urban private sector goods:

$$Z_3 = \frac{P_K Z_P}{PC_3}, \tag{47}$$

where P_K is the price of capital goods.

2.4 External Trade

As indicated earlier, firms in agriculture allocate their output to exports or the domestic market according to the PPF specified in equation (3) and the relative price of exports, PE_1, vis-à-vis domestic goods, PD_1. Efficiency conditions require that firms equate this relative price to the opportunity cost in production. This yields:

$$\frac{E_1}{D_1} = \left(\frac{PE_1}{PD_1} \cdot \frac{1-\beta_{ED_1}}{\beta_{ED_1}} \right)^{\sigma_{ED_1}} \tag{48}$$

Similarly, using the PPF specified in equation (11), the allocation of output between exports and domestic sales by firms in the private formal sector is given by

$$\frac{E_3}{D_3^s} = \left(\frac{PE_3}{PD_3} \cdot \frac{1-\beta_{ED_3}}{\beta_{ED_3}} \right)^{\sigma_{ED_3}}, \tag{49}$$

where PE_3/PD_3 is the price of exports relative to the price of domestic goods.

Imports compete with domestic goods in agriculture as well as in the urban formal private sector. Making use of Armington functions for the demand for imported vs. domestic goods and relative prices, import demand for both sectors (M_1 and M_3) can be written as:

$$M_1 = D_1 \left(\frac{PD_1}{PM_1} \cdot \frac{\beta_{Q_1}}{1-\beta_{Q_1}} \right)^{\sigma_{Q_1}}, \tag{50}$$

$$M_3 = D_3 \left(\frac{PD_3}{PM_3} \cdot \frac{\beta_{Q_3}}{1-\beta_{Q_3}} \right)^{\sigma_{Q_3}}. \tag{51}$$

These equations show that the ratio of imports to both categories of domestic goods depends on the relative prices of these goods and the elasticity of substitution, σ_{Q_1} and σ_{Q_3}, between these goods.

2.5 Prices

By definition, the net value of output (that is, gross output adjusted for indirect taxes) in sector i must be equal to value added plus spending on

intermediate inputs (purchased at composite prices):

$$(1 - atx_i)PX_iX_i = PV_iV_i + \sum_{j=1}^{4} a_{ji}PC_jX_i,$$

where PX_i is the gross price of output, and atx_i the indirect tax rate (or a subsidy rate, if negative) on output in sector i, with $atx_2 = 0$ (there is no indirect taxation of informal sector production). From this equation, the net or value added price of output can be derived as

$$PV_i = V_i^{-1}\left\{PX_i(1 - atx_i) - \sum_{j=1}^{4} a_{ji}PC_j\right\}X_i. \tag{52}$$

The world prices of imported and exported goods are taken to be exogenously given. The domestic currency price of these goods is obtained by adjusting the world price by the exchange rate, with import prices also adjusted by the tariff rate, itm:

$$PE_i = wpe_iER, \text{ for } i = 1, 3, \tag{53}$$

$$PM_i = wpm_i(1 + itm_i)ER, \text{ for } i = 1, 3. \tag{54}$$

Because the transformation function between exports and domestic sales of agricultural goods is linear homogeneous, the gross output price, PX_1, is derived from the expenditure identity:

$$PX_1 = \frac{PD_1D_1 + PE_1E_1}{X_1}. \tag{55}$$

Similarly, the gross output price in the urban formal private sector, PX_3, is given by

$$PX_3 = \frac{PD_3D_3 + PE_3E_3}{X_3}. \tag{56}$$

The price of domestic sales in agriculture, PD_1, adjusts to equilibrate supply and demand.[14] For the price of domestic sales by firms in the urban

[14]In solving the model, equation (50) is used to solve for PD_1, and, because $Q_1^s = Q_1^d$, (41) is used to solve for the equilibrium value of Q_1. The composite good CES equation (39) is then inverted to solve for M_1 and the CET function (3) is inverted to solve for D_1. This procedure ensures that the composite price (and thus indirectly the price of domestic sales) adjusts to equilibrate supply and demand.

formal private sector, PD_3, two options are considered. In the first case, PD_3 is assumed to be fully flexible and determined in a manner similar to PD_1. In the second, PD_3 is assumed to be set as a markup over variable costs. Because both private and public stocks of physical capital are taken as given, total variable costs (involving labor and intermediate consumption) associated with private urban production, TVC_3, are given by

$$TVC_3 = [(1 + ptx_U)W_M - ES_U]U_3^d + W_S S_3^d + X_3 \sum_i a_{i3} PC_i. \tag{57}$$

The average variable cost, AVC_3, is thus

$$AVC_3 = TVC_3 / PX_3 X_3, \tag{58}$$

and the price of domestic sales, PD_3, is therefore given by

$$PD_3 = (1 + mk)AVC_3, \tag{59}$$

where mk is the constant markup rate. Given this specification, and to maintain market equilibrium, the actual quantity of domestic goods must be assumed to be determined by the demand side, and the production function can be inverted to solve for the demand of one of the labor categories. Firms would thus typically be "off" their optimal labor demand curve.

For the agricultural sector and the urban formal private sector, the substitution function between imports and domestic goods is also linearly homogeneous, and the composite price for each sector, PQ_i, is determined accordingly by the expenditure identity:

$$PQ_i = \frac{M_i PM_i + D_i PD_i}{Q_i^d}, \text{ for } i = 1, 3. \tag{60}$$

The actual sales price for the agricultural and formal private sector goods, PC_i, differs from the composite price as a result of a sales tax, levied at the rate stx_i:

$$PC_i = (1 + stx_i)PQ_i, \text{ for } i = 1, 3.$$

For the informal and public sectors (both of which do not export), the composite price is equal to the domestic market price. In turn, because these

sectors do not compete with imports, the domestic price, PD_i, is simply equal to the gross output price, PX_i:

$$PQ_i = PD_i = PX_i = PC_i, \text{ for } i = 2, 4, \tag{61}$$

where $stx_i = 0$, for $i = 2, 4$.

The nested CES production function of private formal urban goods is also linearly homogeneous; prices of the composite inputs are therefore derived in similar fashion:

$$J_H P_H^J = J_L P_L^J + [(1 + ptx_U)W_M - ES_U]U_3. \tag{62}$$

$$J_L P_L^J = PR_3 + W_S S_3, \tag{63}$$

where PR_3 is (before tax) profits by private firms in the formal urban sector, which is here viewed as the (gross) return to physical capital.

The price of capital is constructed by using the identity defining investment expenditure, equation (47), which involves only the urban private sector good:

$$P_K = \frac{PC_3 Z_3}{Z_P} = PC_3, \tag{64}$$

because $Z_3 = Z_P$.

The consumption price index for the rural sector is given by

$$P_R = \sum_i \theta_i^R PC_i,$$

where $0 < \theta_i^R < 1$ denotes the relative weight of good i in the index, with $\sum_i \theta_i^R = 1$. Similarly, the consumption price indexes for urban unskilled and skilled workers are given by

$$P_{UU} = \sum_i \theta_i^U PC_i, \quad P_{US} = \sum_i \theta_i^S PC_i, \tag{65}$$

where the θ_i^U and θ_i^S are relative weights that reflect the composition of spending by each group in a base period, with $\sum_i \theta_i^U = \sum_i \theta_i^S = 1$. As noted below, these indexes are used to update the rural and urban poverty lines in simulation experiments.

2.6 Profits and Income

Firms' profits are defined as revenue minus total labor costs. In the case of the agricultural sector firms, and urban informal sector firms, profits are simply given by

$$PR_i = PV_i V_i - W_i U_i, \text{ for } i = 1, 2. \tag{66}$$

Profits of urban private sector firms account for both working capital costs and salaries paid to both categories of workers, as well as payroll taxes and firing costs, FC, for both categories of workers:[15]

$$PR_3 = PV_3(V_3 - FC) - [(1 + ptx_U)W_M - ES_U]U_3 - W_S S_3, \tag{67}$$

where total firing costs are given by

$$FC = f_U \max(0, U_{3,-1} - U_3) + f_S \max(0, S_{3,-1} - S_3), \tag{68}$$

with f_S, f_U denoting the fixed firing cost per worker (skilled and unskilled, respectively).

Household income is based on the return to labor (salaries), distributed profits, and government transfers. Households are defined according to the level of skills of its members and their sector of employment. There is one rural household, (indexed by a) comprising all workers employed in agriculture. In the urban sector there are two types of unskilled households (denoted by b and c), those working in the informal sector and those employed in the formal sector ((both public and private). The fourth household (denoted by d) consists of skilled workers employed in the formal urban economy (in both the private and public sectors). Finally, there is a capitalist-rentier household (denoted by e) whose income derives mainly from firms' net earnings in the urban private sector. Households in both agriculture and the informal urban economy own the firms in which they are employed.

Income of agricultural and informal sector households is given by, with $h = a, b$ and $i = 1, 2$:

$$YH_h = (PR_i + W_i U_i) + \gamma_h TR = PV_i V_i + \gamma_h TR, \tag{69}$$

[15]Note that payroll taxes are assumed to be levied on the total wage bill excluding interest payments, that is, $W_M U_3$ instead of $(1+i_L)W_M U_3$. Note also that firing costs are assumed to be paid on the total reduction in the number of workers, thereby neglecting "natural" attrition (retirement) and voluntary quits.

where γ_h is the portion of total government transfers (TR) each group receives.

Income of the urban formal unskilled, and skilled households, depends on government transfers, salaries, and possibly redundancy payments; firms provide no source of income, because these groups do not own the production units in which they are employed:

$$YH_c = W_M U_3 + W_{UG} U_4 + PV_3 f_U \max(0, U_{3,-1} - U_3) + \gamma_c TR, \tag{70}$$

$$YH_d = W_S S_P + W_{SG} S_G + PV_3 f_S \max(0, S_{3,-1} - S_3) + \gamma_d TR, \tag{71}$$

where S_G is the total number of skilled workers in the public sector, engaged in both the production of services and training (see (33)).

Firms in the private urban sector pay income taxes, and interest on their foreign borrowing, FL_3. Their net (after-tax) profits, NPR_3, are thus

$$NPR_3 = (1 - itx_f)PR_3 - i^* ER \cdot FL_{3,-1}, \tag{72}$$

where itx_f is the corporate income tax rate and i^* is the interest rate paid on foreign loans, taken to be exogenous. A portion of these net profits, χ, are retained for the purpose of financing investment; the remainder is transferred to the capitalist-rentier household. Thus, total income of that group is given by

$$YH_e = (1 - \chi)NPR_3 + \gamma_e TR. \tag{73}$$

2.7 Private Consumption and Savings

Each category of household $h = a, ...e$ saves a fixed fraction, $0 < sr_h < 1$, of its disposable income:

$$SAV_h = sr_h(1 - itx_h)YH_h, \tag{74}$$

where $0 < itx_h < 1$ is the income tax rate applicable to household h.

The portion of disposable income that is not saved is allocated to consumption:

$$CO_h = (1 - sr_h)(1 - itx_h)YH_h. \tag{75}$$

2.8 Private Investment

Capital accumulation occurs only in the urban formal private sector. To examine the decision to invest, define first the after-tax rate of return on private physical capital, IK, as the ratio of net profits to the stock of capital:

$$IK = \frac{(1 - itx_f)PR_3}{P_K K_3}. \tag{76}$$

The desired capital stock by firms in the private formal urban sector is determined so as to equate the after-tax rate of return on capital, plus the rate of capital gains due to changes in the price of capital, and minus depreciation (at the rate δ_3) to the opportunity cost of investment, which (assuming the absence of "effective" restrictions to capital mobility) is here taken to be the world interest rate, adjusted for the rate of depreciation of the nominal exchange rate, ε:

$$IK - \delta_3 + \frac{\Delta P_K}{P_{K,-1}} = i^* + \varepsilon, \tag{77}$$

where $0 < \delta_3 < 1$. One could also add to the marginal cost of foreign capital on the right-hand side of this equation a risk premium, to reflect the type of imperfections that developing countries face on world capital markets. Such a premium could be specified, for instance, as a convex function of the difference between the value of the private capital stock, $P_K K_3$, relative to firms' foreign borrowing, $ER \cdot FL_3$, which in the present setting represents a measure of firms' net worth.

Using equation (76), and setting $\varepsilon = 0$, this arbitrage condition yields[16]

$$K_3^* = \frac{PR_3}{P_K} \cdot \frac{(1 - itx_f)}{i^* + \delta_3 - \Delta P_K / P_{K,-1}}. \tag{78}$$

Actual investment in each period is determined by a partial adjustment process, and is given as a function of the ratio between the desired capital stock and last period's capital stock:

$$\frac{Z_P}{K_{3,-1}} = z_0 \left\{ \frac{K_{3,}^*}{K_{3,-1}} \right\}^{\sigma z}, \tag{79}$$

[16] When checking for homogeneity of degree zero in prices (including the exchange rate, which is the numéraire here), the rate of depreciation must indeed be accounted for in (78).

where $z_0, \sigma_Z > 0$. This investment function is, of course, very simple and does not account for a variety of other factors that have been shown to be important for developing countries—such as inflation, macroeconomic volatility, public capital in infrastructure, and possibly foreign borrowing.[17] Some of these modifications can easily be introduced. Note also that, although there is no direct effect of the public capital stock in infrastructure, K_R, on private investment, K_R does affect the overall stock of public capital, K_G (defined below), which in turn affects the production process—and thus indirectly the desired capital stock, through profits.

The capital stock depends on the flow level of investment, Z_P, and the depreciation rate:

$$K_3 = K_{3,-1}(1 - \delta_3) + Z_{P-1}. \tag{80}$$

The net worth of private urban firms in nominal terms, NW_3, is defined as the value of physical capital, net of foreign borrowing, FL_3:

$$NW_3 = P_K K_3 - ER \cdot FL_3,$$

which changes over time according to

$$NW_3 = NW_{3,-1} + P_K \Delta K_3 - ER \cdot \Delta FL_3 + \Delta P_K K_{3,-1}.$$

The last term on the right-hand side of this expression represents capital gains associated with changes in the price of capital. Note that changes in NW_3 have no feedback effects on the economy, unlike what happens in the "full" IMMPA model of Agénor, Izquierdo and Fofack (2003), in which banks charge a risk premium on their loans that is inversely related to the borrower's net worth. In the present setting, a feedback effect could be introduced by adding a risk premium to the marginal cost of *foreign* capital, as noted earlier.

The *ex post* aggregate identity (or *ex ante* equilibrium condition) between savings and investment is specified as follows. Total gross investment in physical capital measured in nominal terms, which is equal to $P_K(Z_P + Z_G)$, is financed by firms' after-tax retained earnings, total after-tax household savings, "primary" government savings (that is, before investment), and foreign

[17] See Agénor (2000, Chapter 1), Agénor and Montiel (Chapter 3), Agénor, Izquierdo, and Fofack (2003), Jimenez (1995), and recent studies by Sanchez-Robles (1998), Ahmed and Miller (2000), Ghura and Goodwin (2000), Hendricks (2000), and Wang (2992).

borrowing by firms and the government. Given the definition of the *overall* government fiscal balance given below in (84), $GBAL$, this identity can therefore be written with private investment only on the left-hand side:

$$P_K Z_P = \chi NPR_3 + \sum_h SAV_h + GBAL + ER(\Delta FL_3 + \Delta FL_G), \qquad (82)$$

where FL_G is foreign borrowing by the government. In the simulations reported below this equation is solved residually for the savings rate of rentiers and capitalists, sr_e. In that sense, then, the basic model is "investment driven", although of course other closure rules are possible. For instance, one could solve "backward" for the government budget balance and determine the level of current public expenditure that is consistent with (82). Alternatively, one could drop purely and simply the investment equation (79) and solve (82) instead for Z_P. In that case, then, the model would be "savings driven" (see Dewatripont and Michel (1987)).

2.9 Public Sector

Government expenditures consist of final consumption, which only has demand-side effects, and public investment, which has both demand- and supply-side effects. Total public investment, Z_G, consists of investment in infrastructure, I_R, education, I_E, and health, I_H,which are all considered exogenous policy variables:[18]

$$Z_G = I_R + I_E + I_H. \qquad (83)$$

Investment in infrastructure consists of the accumulation of public capital such as roads, power plants and railroads. Investment in education consists of the accumulation of assets such as school buildings and other infrastructure affecting the acquisition of skills (for instance, research institutions), but does not represent human capital. In a similar fashion, investment in health adds to the stock of public assets such as hospitals.

From (13), $PV_4V_4 - (W_{UG}U_4 + W_{SG}S_4) = 0$, that is, all value added generated by the production of public goods is distributed as wages. The

[18]See Jimenez (1995), Tanzi and Zee (1997), Sanz and Velázquez (2001), and Webber (2002), for a discussion of the links between the composition of public investment and growth. It should be noted that this treatment of public investment differs from standard data classification reported in national accounts; in many instances these investments are classified as current expenditures.

government fiscal balance, $GBAL$, is thus defined as

$$GBAL = TAX - TR - W_{SG}S_G^E - ES_U U_3^d - PC_3(G_C + Z_G) - i_G^* ER \cdot FL_{G,-1}. \tag{84}$$

where TAX denotes total tax revenues, TR government transfers to households, $W_{SG}S_G^E$ the wage bill on school teachers, $ES_U U_3^d$ total employment subsidies to firms in the private formal sector, G_C other real current expenditures on goods and services, Z_G real investment spending, and $i_G^* ER \cdot FL_{G,-1}$ is interest payments on foreign borrowing.

Total tax revenues consist of revenue generated by import tariffs, sales taxes, income taxes, and payroll taxes on unskilled labor:

$$\begin{aligned} TAX &= \sum_{i=1,3} itm_i(ER \cdot wpm_i M_i) + ptx_U W_M U_3 \\ &\quad + itx_f PR_3 + \sum_{i=1}^{4} atx_i PX_i X_i + \sum_h itx_h YH_h + \sum_{i=1,3} stx_i PQ_i Q_i, \end{aligned} \tag{85}$$

with $atx_c = 0$.

Public investment in infrastructure, health, and education, determines the rate at which the stock of each type of public capital, K_j, with $j = E, H, R$, grows over time. Accumulation of each type of capital is thus defined as:

$$K_j = K_{j,-1}(1 - \delta_j) + I_{j,-1}, \text{ where } j = E, H, R. \tag{86}$$

where $0 < \delta_j < 1$ is a depreciation rate.

Infrastructure and health capital are combined through a CES function to produce the stock of public capital, K_G:

$$K_G = \alpha_G\{\beta_G K_R^{-\rho_G} + (1 - \beta_G)K_H^{-\rho_G}\}^{-\frac{1}{\rho_G}}. \tag{87}$$

2.10 Balance of Payments

The external constraint implies that any current account surplus (or deficit) must be compensated by a net outflow (or inflow) of foreign capital, given by the sum of changes in net foreign borrowing by the government, ΔFL_G, and private firms, ΔFL_3:

$$\sum_{i=1,3}(wpe_i E_i - wpm_i M_i) + i^*(FL_{G,-1} + FL_{3,-1}) + \Delta FL_G + \Delta FL_3 = 0. \tag{88}$$

In the simulations reported below, I assume that public foreign borrowing is exogenous, and that private foreign borrowing adjusts to equilibrate the balance of payments.

Figure 3 summarizes the structure of the labor market in mini-IMMPA, whereas Figure 4 captures overall linkages. Appendix A provides a complete list of equations, Appendix B variable definitions, and Appendix C discusses calibration and solution procedures, as well as parameter values.[19]

2.11 Poverty and Distributional Effects

The procedure followed in mini-IMMPA to assess the poverty and distributional effects of exogenous and policy shocks is similar to the one in IMMPA, which is described at length in Agénor, Izquierdo, and Fofack (2003) and evaluated against several alternatives by Agénor and Grimm (2003). This procedure assumes that initial rural and urban poverty lines are exogenously set in real terms and involves linking the "structural" component described earlier to a household income and expenditure survey, organized along the household structure described earlier. Specifically, the calculation of poverty indices—the poverty headcount index (the proportion of individuals earning less than the poverty line) and the poverty gap (the average shortfall of the income of the poor with respect to the poverty line, multiplied by the headcount index)—as well as distributional indicators (the Gini coefficient and the Theil inequality index) involves the following steps:

- Step 1. Classify the data in the household survey into the categories of households contained in the structural component of the model. Here, as noted earlier, there are five categories of households—workers in the rural sector, those in the urban (unskilled) informal economy, urban unskilled workers in the formal sector, urban skilled workers in the formal sector, and capitalists-rentiers.

- Step 2. Following a policy or exogenous shock, generate real growth rates in per capita consumption and disposable income for all five cat-

[19] As implied by Walras' Law, one equilibrium condition may be dropped because it can be deducted from the other equilibrium conditions. Instead of dropping one equation, the computer program checks numerically for continuous equality between savings and investment, as given in equation (82), by ensuring that a residual variable is continuously equal to zero.

egories of households, up to the end of the simulation horizon (say, T periods).

- **Step 3**. Apply these growth rates separately to the per capita (disposable) income and consumption expenditure for each household in the survey. This gives a new vector of absolute income and consumption levels for each group, for periods $1, ...T$.

- **Step 4**. Calculate poverty and income distribution indicators, using the new absolute nominal levels of income and consumption for each individual and each group, and after updating the initial rural and urban poverty lines, using the prices indexes generated by the structural component of the model, to reflect changes in the price of the consumption basket and purchasing power of income.

- **Step 5**. Using the rates of growth of employment generated by the structural component of the model, adjust the relative weights of each household group in the urban sector (as given in the survey) and calculate the reweighted poverty and distributional indicators for that sector as a whole.[20]

- **Step 6**. Compare the post-shock poverty and income distribution indicators with the baseline values to assess the impact of the shock on the poor and the degree of inequality for periods $1, ...T$.

The household survey that I use to perform the policy experiments reported below is an artificial survey, constructed as follows. First, a sample of 5,000 observations was produced, with the share of each household group corresponding exactly to that in the structural component of the model.[21] Each observation was considered to represent one household. Second, using a random number generator and a log-normal distribution, values for disposable income and consumption expenditure were drawn for each household. As parameters for each group, the initial values for average disposable income and

[20]The same reweighting procedure would need to be applied to the rural sector if there was more than one category of households there.

[21]These shares are 28.2 percent of workers in the rural sector, 45.3 percent of workers in the informal urban sector, 13.7 percent of unskilled workers in the formal urban sector, 9.9 percent of skilled workers in the formal urban sector, and 3 percent of capitalists and rentiers.

average consumption expenditure (which are taken from the calibrated database) are imposed as mean and as standard deviation. For skilled workers in the formal urban sector and for capitalist and rentiers, a standard deviation of 0.8 times the mean is assumed. Figure 5 shows the distribution of consumption in each group. Third, the income poverty line for the rural sector is set (somewhat arbitrarily) such that the percentage of rural households in poverty is 50 percent. The poverty line in urban areas is then assumed to be 15 percent higher. The rural and urban poverty lines for consumption expenditure are calculated in the same manner. This procedure produces an economy-wide, income-based headcount poverty index of 38.6 percent and an economy-wide consumption-based headcount index of 41.1 percent. For income distribution, the overall Gini index is 0.48 (consumption based) and 0.49 (income based).[22] The within-group Theil inequality decomposition is 78 percent (consumption based) and 73 percent (income based).

3 Policy Experiments

Mini-IMMPA can be used to analyze a variety of policy and exogenous shocks. For illustrative purposes, the growth, unemployment and poverty effects of two types of labor market policies are examined in this section: a cut in the minimum wage and a reduction in the payroll tax rate on unskilled labor.[23] Both experiments relate to critical policy issues in developing countries. Economists have long debated the role of minimum wage legislation in labor market adjustment. Advocates have often viewed minimum wages as being beneficial in various ways—through its positive effect on nutrition or productivity, or as an instrument of income redistribution and social justice. By contrast, opponents argue that minimum wage legislation, by preventing wages from adjusting downward to excess supply of labor, imposes an implicit tax on employers in the formal economy, leads to misallocation of labor (by preventing wages from adjusting downward to excess supply of labor) and creates unemployment (particularly for unskilled workers), induces labor market

[22]The income-based Gini coefficients are 0.45 for the rural sector, 0.48 for the urban sector, 0.44 for the informal sector households, 0.43 for urban unskilled households, 0.38 for urban skilled households, and 0.39 for capitalists and rentiers.

[23]In these simulations, PD_3 is assumed to be fully flexible, the skilled wage-setting equation (29) and the effort function (38) are used, and both the unskilled public sector wage and the minimum wage are taken to be fixed in nominal terms ($idx_U = idx_M = 0$).

segmentation, and depresses wages in the informal urban sector—which has an adverse effect on the poor. By increasing the relative cost of employing unskilled workers, a high minimum wage may also accelerate the substitution of capital for unskilled labor and reduce profits—and thus firms' capacity to invest. As a result of both factors, high minimum wages may restrain the expansion of labor demand over time. Thus, a government-mandated increase the minimum wage (assuming that it is binding) may not only reduce employment but also raise poverty, because the increase in the marginal cost of labor will lead firms to scale back hiring—forcing the unemployed to enter the informal sector and depressing wages there.[24] Thus, changes in the minimum wage are likely to have important distributional effects among (unskilled) workers, notably between those employed in the formal sector and those in the informal sector. Similarly, in both industrial and developing countries, a flat payroll tax is often imposed on employers to finance general government expenditure, or more specifically the pension system or the unemployment benefit scheme.[25] The conventional, partial equilibrium view suggests that the incidence of such a tax—its actual burden—depends on the elasticity of labor supply and the degree of wage rigidity. But it is also important to account for general equilibrium effects. The effect on wages depends on the structure of the labor market. For instance, an increase in employers' social security contributions may initially cause an increase in labor costs and lower employment; but the ensuing increase in unemployment may drive wages down over time, thereby offsetting the higher non-wage costs. In addition, the effect of a reduction in payroll taxation depends to a very significant extent on how the cut is financed; with a binding budget constraint, reducing the payroll tax requires shifting the tax burden to some other tax base. Thus, it is important to consider alternative financing rules in evaluating the effect of a cut in the payroll tax.

[24] If a binding minimum wage does not reduce employment among the poor, it will also reduce poverty if a large number of poor households consist of low-wage workers. However, in many poor households, no one may be employed in a formal sector job. If indeed low-paid workers are not in poor households, much of an income gain that may come from an increase in the minimum wage would benefit those that are not poor to begin with.

[25] Financing of unemployment benefit schemes is in general usually shared between employers and employees—but the employers' contribution is usually substantially higher than employees' contribution.

3.1 Reduction in the Minimum Wage

The simulation results associated with a permanent, 5 percent reduction in the minimum wage are illustrated in Tables 1 and 2, which display relative and absolute percentage changes from the baseline solution, respectively, for the first 10 periods after the shock. This time period is referred to below as the "adjustment period." The experiment assumes that the government borrows domestically to finance its deficit—implying therefore (as discussed earlier) an offsetting adjustment in the savings rate of capitalists and rentiers, in order to maintain the aggregate balance between savings and investment (equation (82)).[26] Table 1 provides data on national accounts, fiscal accounts, and the labor market, whereas Table 2 shows changes in prices, consumption and income for each household group, and poverty and distributional indicators, both income- and consumption-based. Also shown in Table 2 is the real exchange rate, defined as a weighted average of the domestic-currency price of exports and imports (with weights based on initial volumes of trade), divided by a weighted average of the price of domestic sales of agricultural and private sector goods.

The impact effect of the reduction in the minimum wage is an increase in the demand for unskilled labor in the private sector of the order of 4.3 percent in the first year. The increase in demand is met by the existing pool of unskilled workers seeking employment in the urban sector. As a result, the unskilled unemployment rate drops significantly, by 2.8 percentage points in the first year.[27] The cut in the minimum wage, by reducing the relative cost of unskilled labor, leads to substitution among production factors not only on impact but also over time. Because unskilled labor has a relatively high elasticity of substitution with respect to the composite factor consisting of skilled labor and physical capital, the lower cost of that category of labor gives private firms in the formal sector an incentive to substitute away from skilled labor and physical capital. In turn, the fall in the demand for that category of labor puts downward pressure on skilled wages, which drop by 1.6

[26] How this "transfer" of private savings to the government takes place is not explicitly specified; one can think of a "pure" financial intermediary operating in the background. Note that a more elaborate approach would involve accounting explicitly for the issuance of government bonds, and thus portfolio decisions on the part of savers.

[27] Note that, from equation (23), the initial change in unskilled unemployment is given by $\Delta UNE_{U,0} = -\Delta U^d_{3,0}/U^s_F$. It therefore depends on the initial number of workers seeking employment in the formal sector. Similarly, from (32), $\Delta UNE_{S,0} = -\Delta S^d_{3,0}/S$.

percent in the first period. On impact, labor supply is fixed in agriculture and the informal economy, so the level of employment does not change in either sector—and neither does the level of activity (real value added in both sectors is constant). The rise in real disposable income (by 1.1 percent and 1.5 percent, respectively) and real consumption of rural and informal sector households leads to higher value added prices and higher wages in both sectors. But value added prices go up by slightly more than wages in the second and subsequent periods, implying a fall in the product wage in both sectors and a rise in employment.

Over time, changes in wage differentials affect both rural-urban and formal-informal migration flows, and therefore the supply of labor in the various production sectors. The expected unskilled wage in the formal economy is constant on impact, as implied by (17) and (18). Despite the increase in unskilled employment in the private sector in the first period (and thus the increase in the probability of finding a job), the fall in the minimum wage is such that the urban expected wage falls. Moreover, because agricultural sector wages rise, the expected urban-rural wage differential (measured in proportion of the rural wage) falls by 8.7 percentage points in the second period, with this differential narrowing over time. As a result, the inflow of unskilled workers into the formal sector (measured in proportion of the total formal urban labor supply) falls by about 1.2 percent in periods 2 and 3. The reduction in the inflow of labor leads to an increase in informal sector wages throughout the adjustment period, by 2.6 percent in period 2, 1.6 percent in period 3, and so on. This increase in the informal sector wage, coupled with the reduction in the minimum wage (as well as the expected wage in the urban formal private sector, despite the higher employment probability) leads to a sharp fall in period 2 in the expected formal-informal wage differential. This tends therefore to reduce (by 1.2 percent in period 2, and about 2 percent over the entire adjustment period) the number of workers willing to queue for employment in the urban private sector. This, coupled with the sustained effect of the cut in the minimum wage on labor demand, explains the large effect on unemployment, which averages about 5 percent in the long run. Note also that throughout the adjustment period, despite significant fluctuations in the expected formal-informal wage differential and formal-informal migration flows, the supply of unskilled labor in the formal private sector remains systematically lower than its baseline value.

Although the behavior of nominal wages in agriculture reflects essentially changes in value added prices on impact (as noted earlier), over time it is

also affected by changes in labor demand –induced by changes in households' disposable income and expenditure—and migration flows. After an initial increase in nominal wages, lower migration flows to urban areas begin to put downward pressure on rural wages, which end up falling (in nominal terms) by 1.6 percent in period 9 and 1.8 percent in the last period. As also indicated earlier, the reduction in the cost of unskilled labor induces a substitution away from skilled labor, which brings a sustained fall in skilled wages in nominal terms (by about 1.3 percent in the long run). However, the overall effect on labor demand is not large; skilled employment in the private formal sector falls in the long run by only about 0.1 percent. And because the supply of skilled labor remains roughly constant throughout (public investment in education and the number of school teachers are held constant at their baseline values), the skilled unemployment rate rises by about the same amount (in percentage points).[28] The reason for the small effect on skilled employment is that the direct substitution effect associated with the reduction in the minimum wage is offset by a fall in the skilled wage, resulting from general equilibrium effects—the drop in the nominal skilled wage is less than the fall in the value added price of the urban private formal sector, implying a rise in the product wage, and thus dampening the demand for labor. For instance, the nominal skilled wage drops by 1.6 percent in period 1, 2.4 percent in period 2, 1.4 percent in period 3, and 0.7 percent in period 4; at the same time, the price of value added in the private formal sector drops by 2.4 percent in period 1, 3.1 percent in period 2, 2.0 percent in period 3, and 1.4 percent in period 4.

The long-run effect on aggregate output (or real GDP) is slightly positive, at about 0.3 percent.[29] Changes in real output (as measured by real value added) are also positive and small in the urban informal sector, but between 0.7 to 1 percent in agriculture and the urban formal sector, which reflects here essentially changes in private activity. The impact on agricultural output tends to grow slightly over time, as a result of the gradual fall in agricultural wages, as noted earlier.

[28] As implied by equation (38), the level of effort of skilled workers changes as a result of variations in the skilled unemployment rate. However, given the magnitude of these variations, and the elasticity of the effort function with respect to relative wages, the impact on the supply of skilled labor is negligible relative to the baseline.

[29] Note that this analysis of the growth effects of a cut in the minimum wage does not account for the possible negative externality that may arise if such a cut reduces incentives for human capital accumulation, as emphasized by Cahuc and Michel (1996).

On the fiscal side, tax revenue falls by about 0.2 percentage points as a share of GDP during the adjustment period, mostly as a result of indirect taxes changing at a slower pace than nominal GDP. Because public investment falls by about 0.1 percentage points of GDP (reflecting a lower price of capital, that is, because $P_K = PV_3$, a fall in the value added price in the urban private formal sector), the increase in the overall deficit is about 0.1 percent of GDP. This deficit is financed by domestic borrowing. From the aggregate balance between investment and savings, and given the closure rule discussed earlier, this means that the savings rate of capitalists and rentiers has to increase to maintain equilibrium. Given the small size of that group (about 3 percent of the total number of households), this increase turns out to be quite large—between 5.8 and 6.6 percentage points in the long run.[30]

Despite relatively large changes in real consumption and disposable income (mostly in urban areas), overall poverty indicators for the rural and urban sectors change relatively little during the adjustment period. This is, of course, related to the fact that the aggregate growth and income effects of the shock are fairly limited and involve essentially a re-allocation of resources across sectors. In addition, however, there are significant differences among household groups within the urban sector. In particular, although real consumption of the capitalists-rentiers group drops significantly, and the incidence of poverty (as measured by the consumption-based headcount index) increases slightly toward the end of the adjustment period, the *depth* of poverty (as measured by the poverty gap) is barely affected in either the short or the long run. By contrast, income-based poverty indicators barely change. This difference in behavior of the two sets of indicators is, of course, related to the fact that the savings rate of capitalists and rentiers is endogenously determined, thereby affecting directly expenditure patterns, rather than the level of income (see (75)). For unskilled workers engaged in the informal and formal sectors, both measures of poverty indicate a slight improvement in the longer run, regardless of whether the consumption- or income-based measure is used. This is also the case in the short run for informal sector workers. However, for unskilled workers in the formal sector, poverty increases slightly on impact—by about 0.1 percentage points when the income-based headcount index is used—and so does the skilled poverty

[30]It is worth noting that, if instead a "classical closure" had been chosen (with private investment determined residually), the government deficit would have had a direct crowding out effect on private capital formation. See, for instance, the discussion by Agénor and El Aynaoui (2003) of the case of Morocco in a similar setting.

rate in the longer run. There is therefore a potential *trade-off* emerging between unemployment and poverty: although the reduction in the minimum wage raises unskilled employment in the formal sector, it also increases poverty (albeit slightly) in the short term for that category of households, whereas the poverty rate for skilled workers in the formal sector rises both in the short and the long run. Changes in the consumption-based Gini coefficient indicate that income distribution is affected quite significantly by a cut in the minimum wage; the degree of inequality falls by more than one percentage point in the long run. This effect is directly related to the sharp reduction in consumption experienced by capitalists and rentiers, relative to other household groups.

3.2 Cut in Payroll taxes on Unskilled Labor

The simulation results associated with a permanent, 5 percentage-point reduction in the payroll tax rate on unskilled labor are illustrated in Tables 3 to 8. The results correspond to three alternative budget financing rules: domestic borrowing (that is, an endogenous adjustment in the capitalists-rentiers savings rate, as in the previous case) with no offsetting tax change; an offsetting, revenue-neutral increase in sales taxes on private formal sector goods only; and a revenue-neutral increase in income taxes.[31]

3.2.1 Domestic Borrowing

Consider first the case of domestic borrowing (Tables 3 and 4). The impact effect of a reduction in the payroll tax rate is qualitatively similar to a cut in the minimum wage, as discussed earlier: by reducing the effective cost of unskilled labor, it tends to increase immediately the demand for that category of labor—in the present case by 3.4 percent in the first year, and by about the same amount on average during the adjustment period. The unskilled unemployment rate drops by 2.2 percentage points in the first year as well, and in the long run by an average of 1.4 percent. And the reduction in the

[31] A potential problem with these simulations, as in other studies along the same line—such as Drèze et al. (1984)—is the failure to distinguish between changes in *average* tax rates, and changes in *marginal* tax rates. The effects could be very different. For instance, a reduction in the average payroll tax rate might reduce "wage-push" pressures, whereas a cut in marginal rates might reduce the unemployment cost of achieving a higher net income, thereby influencing trade unions' bargaining strategies.

"effective" cost of unskilled labor leads firms in the private formal urban sector to substitute away from skilled labor and physical capital, leading to a reduction in skilled wages in nominal terms (by 1.4 percent in period 1, 2.5 percent in period 2, 1.9 percent in period 3, and 1.1 percent in period 4) and a reduction in the price of capital (that is, the price of the private formal good) by about 1.2 percent on impact. In the present case, however, the skilled nominal wage falls by more than the price of value added in the private formal sector (which drops by 1.2 percent in period 1, 2.1 percent in period 2, 1.4 percent in period 3, and 0.7 percent in period 4), implying a fall in the skilled product wage and stimulating the demand for that category of labor. Thus, the adverse impact of the substitution effect induced by the reduction in the cost of unskilled labor on the demand for skilled labor is dampened. Overall, skilled employment falls by about 0.1 percent on impact and 0.2 percent in the longer run, bringing with it a concomitant increase in the skilled unemployment rate.

The behavior of the (expected) urban-rural wage differential follows a pattern qualitatively similar to the one described in the previous experiment, although the magnitude of the initial effects are not as large. The expected formal-informal wage differential, however, *increases* now in the second period. The reason is that the minimum wage does not change this time around, and the increase in unskilled employment raises the probability of finding a job in the private sector, thereby increasing the expected formal sector wage. As a result, therefore, there is an *increase* in the number of unskilled job seekers in the formal economy (by 0.6 percent in period 2), which therefore mitigates the initial reduction in unemployment. In the subsequent period, however, because of the sharp increase in the informal sector wage (itself due to the reduction in labor supply in the informal economy), the formal-informal wage differential moves in the opposite direction and by about the same amount (1.8 percentage points)—thereby reducing the number of unskilled job seekers in the formal sector. These fluctuations in wage differentials, migration flows, and labor supply in the formal and informal sectors continue throughout the adjustment period.

The overall effect on aggregate real output is, again, fairly small—given that this is also a shock that fundamentally entails a change in relative prices as the initial impulse (in both cases, a change in the relative price of unskilled labor). An important feature of the long-run adjustment process, however, is a reduction in the size of the informal sector and an expansion of the private formal urban sector, which essentially results from the transfer of

unskilled labor across these two sectors. This result is therefore consistent with the widely-held view (discussed in the introduction) that reducing the tax burden on the formal sector is essential to limit the growth of the informal sector, although in the present case the "disincentive" effects of taxation are indirect and captured at the level of firms, and do not account explicitly for the propensity to evade income taxes by individuals. The government budget is of course more significantly affected, with indirect tax revenue falling by about 0.4 percentage points of GDP. Despite the drop in the price of capital (which tends to raise the desired capital stock, as implied by (78)), the drop in profits—resulting from the reduction in private consumption by capitalists and rentiers, and to a lesser extent by skilled households in the formal sector—private investment drops significantly in the first 2-3 periods following the shock, recovering partly thereafter. Because the current account improves (by about 0.6 percentage points of GDP in the long run), private capital inflows fall. Despite the initially large reduction in private investment, borrowing by the government and the reduction in foreign savings lead to a fairly significant increase in the savings rate of capitalists-rentiers relative to its baseline value (about 8 percentage points during the adjustment period).

Poverty and distributional indicators are affected in the same direction as before. In particular, after increasing during the first part of the adjustment period, the consumption-based headcount index for capitalists and rentiers shows a slight increase toward the end of the adjustment period, whereas the poverty gap barely changes. And because the drop in consumption for that category of households is larger than in the case of a cut in the minimum wage, the degree of inequality (as measured by the consumption-based Gini coefficient or the Theil index) falls by a larger amount. In addition, in the present case, the poverty rate for unskilled households in the formal sector drops on impact, with no significant long-run effect, whereas skilled poverty rates increase throughout the adjustment period.

3.2.2 Revenue-Neutral Change

Consider now the case where the effect of the cut in payroll taxes on overall tax revenue is offset by either an increase in sales taxes on private formal sector goods (Tables 5 and 6) or an increase in income taxes (Tables 7 and 8). In the latter case, the increase in the tax rate is assumed to be proportional across all households—except of course for informal sector households, who are not subject to direct taxation to begin with. Put differently, the

offsetting effect in both cases implies a constant level of total tax revenue, after accounting for general equilibrium effects.

In both cases, the impact and longer-run effects of the shock are qualitatively similar to those described earlier, although their magnitude differs. In particular, movements in the informal sector wage are less pronounced, in part because changes in rural-urban migration flows are not as large. By contrast (or, rather, by implication), movements in the expected formal-informal wage differential during the first part of the adjustment period are larger, implying more pronounced movements in the number of job seekers in the formal sector. Compared to the case of private sector borrowing, the reduction in the unskilled unemployment rate is less pronounced with an offsetting change in the sales tax, and of about the same magnitude when the income tax is adjusted, with also similar effects on overall real GDP and private investment. When the sales tax is adjusted, the fall in total private consumption is more pronounced than in the case of domestic borrowing or with an offsetting adjustment in the income tax (see Table 5). The reason, of course, is that the increase in the sales price reduces the purchasing power of income (everything else equal) and tends to reduce demand, particularly in urban areas (see Table 6). In both cases, the offsetting changes in the budget imply that domestic borrowing by the government does not change as a result of the reduction in the payroll tax; thus, the increase in the savings rate of capitalists and rentiers is much less pronounced that in the case in which the government finances its deficit through the private sector.

In both cases, changes in the poverty and distributional effects (as measured by the consumption-based indicators) are also less pronounced initially than in the case of a non-neutral shock, although the income-based poverty gap for formal skilled workers displays slightly larger and more persistent fluctuations in the case of an offsetting income tax change (see Table 8). This is obviously what one would expect given that disposable income for this particular group falls by a much larger amount compared to the non-neutral case—by about 2 percent for skilled workers in the formal sector between periods 6 and 10 (see Table 8), compared to about 0.8 percent with a non-neutral policy shock (see Table 4). As a result, the income-based Gini coefficient falls by more (by about 0.4 percentage points in the long run, compared to 0.2 in the non-neutral case), despite the fact that changes in the consumption-based measures of inequality are less pronounced. Overall, the results indicate that there are some significant differences in economic and poverty outcomes, depending on the offsetting change in the budget that

accompanies the reduction in the payroll tax.

4 Conclusions

The purpose of this paper has been to present the structure of Mini-IMMPA, a specialized version of the Integrated Macroeconomic Model for Poverty Analysis developed by Agénor, Izquierdo and Fofack (2003), and Agénor, Fernandes, Haddad and van der Mensbrugghe (2003), which is particularly suitable for users interested mainly in assessing the quantitative effects of fiscal and labor market reforms on unemployment and poverty. Although Mini-IMMPA focuses only on the "real" side, it offers a more detailed treatment of the labor market than IMMPA (by accounting for features such as public education, employment subsidies, and firing costs) and the tax structure. The first part of the paper described in detail the structure of Mini-IMMPA. In the second part the model was used to analyze the growth, unemployment and poverty effects of two types of labor market policies: a cut in the minimum wage and a reduction in the payroll tax rate on unskilled labor. In particular, the results (which are obviously highly dependent on the selected closure rule) indicated that a reduction in the minimum wage may have a sizable impact on unskilled unemployment, and that the extent to which a reduction in payroll taxes on unskilled labor lower unemployment for that category of labor depends on how they are financed. More generally, the foregoing analysis suggests that the fiscal implications of labor market reforms have to be carefully analyzed in order to assess the potential impact of these reforms on unemployment and poverty. Labor market reforms may end up having a limited overall effect on unemployment and poverty, depending on how they are financed.

Another important implication of the foregoing analysis—which is discussed in more detail in Agénor (2003*a*)—is that labor market reforms aimed at reducing unemployment may end up increasing poverty, if they are implemented in a context in which fiscal constraints impose offsetting changes in financing. Consider, again, a reduction in payroll taxation on unskilled labor. Despite stimulating employment for that category of labor (as mentioned earlier), this policy measure may also lead to higher poverty, depending on how it is financed. An offsetting, across-the-board reduction in transfers, for instance, would have an immediate adverse effect on the poor. Financing through an increase in consumption taxes may raise the price of the con-

sumption basket of the poor and reduce their real income to a level below the poverty line. Financing through higher income taxes may reduce disposable income and the ability to spend; it may also drive over time activity underground, leading to a fall in the overall tax ratio, which in turn could force cuts in expenditure (including transfers to the most needy). Financing through a tax on capital (usually a limited option for governments, due to concerns about capital flight) may lower private investment capital; as noted earlier this may reduce skilled employment and mitigate the overall, positive effect on total employment. Finally, financing through a cut in government spending on infrastructure may affect aversely the overall productivity of production factors in the private sector (including labor) and lead to a reduction in wage income; it may also have a negative impact on private investment. This, in turn, will have an adverse overall effect on the demand for labor (due to the negative effect of investment on growth) as well as an adverse effect on the demand for skilled labor through the complementarity relationship between human capital and physical capital. Thus, although the direct effect of the reduction in the payroll tax rate on the demand for unskilled labor may well be positive (both in the short and medium run), overall employment (and thus unemployment) may not change much, as an increase in the number of unskilled jobs is offset by lower employment of skilled labor. In all of those cases, again, unemployment may fall, but poverty may increase—because of adverse effects on income, due either to lower after-tax wages or lower public transfers. There may therefore be a trade-off between unemployment and poverty goals.

In addition, of course, labor market reforms may themselves be complementary, if labor market institutions are complementary as well. As emphasized by Coe and Snower (1997), this implies that partial or piecemeal labor market reforms are unlikely to achieve significant and persistent reductions in unemployment rates or poverty. For instance, active labor market policies (such as retraining schemes) may not be very effective in the presence of substantial passive policies (such as stringent job security provisions). Reform programs must be sufficiently broad (in the sense of covering a wide range of complementary policies) and deep (of substantial magnitude) to have much of an effect. In addition, these reforms may also need to be combined with measures that address more efficiently the distributional objectives of the pre-reform policies, such as the imposition of high minimum wages.

The Mini-IMMPA prototype developed here can be used to analyze a variety of additional labor market policies. First, it can be used to analyze a

reduction in union bargaining power. To the extent that this translates into lower wages for skilled workers, this may affect incentives to acquire skills. As noted by Lindbeck and Snower (2001), firing costs can increase a union's bargaining power, and help to explain excessive real wages and resultant involuntary unemployment. Second, the model can be used to analyze changes in employment subsidies for unskilled labor. In general, the employment effects of an increase in employment subsidies and reductions in payroll taxes are different, as can be inferred from the results of Pisauro (1991) and Rasmussen (1998). Third, one could study the impact of a reduction in public unskilled employment in the production of government services, coupled with a deficit-neutral increase in subsidies to unskilled employment in the private formal sector.[32]

The prototype presented in this paper can also be extended in a variety of directions. First, to the extent that part of the job problem is a shortage of skilled workers, the model can be extended to account for subsidies to skills acquisition and/or on-the-job training. Second, labor taxation and labor market regulations may encourage firms to go informal.[33] This is captured only indirectly in the present version of the model. But changes in income taxes may have a direct effect on the propensity to go informal; accounting for this effect may lead to an inverted U-shape curve between taxation and the size of the informal sector, depending on the use of tax revenues. Suppose, for instance, that revenues are used to finance higher spending on infrastructure. An increase in income taxes may well have a positive effect on growth initially (by stimulating private production), but a negative effect afterward, as further increases tend to drive activity underground and reduce overall revenue. Finally, the model can be extended to consider the impact of the introduction of social insurance on savings, labor supply, and unemployment.[34]

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[32]Several of these shocks are analyzed by Agénor, Nabli, Yusef, and Henning (2003), in a variant of the present model. Note that a meaningful analysis of public employment and wage shocks requires the introduction of a production function for public services, in order to break the equality between the wage bill and the production of value added.

[33]See for instance Sarte (2000) or Ihrig and Moe (2001) for a model with transitional dynamics, and Schneider and Enste (2000) for a more general discussion. Kugler (2000) develops a model in which job security regulations provide incentives for high turnover firms to operate in the informal sector.

[34]See Karni (1999) for a thorough discussion of analytical issues in the design of unemployment benefit schemes.

Appendix A
Equations of Mini-IMMPA

PRODUCTION

$$X_1 = V_1 + \sum_{i=1}^{4} a_{i1} X_1 \tag{A1}$$

$$V_1 = \left[\alpha_{X_1} \{ \beta_{X_1} U_1^{-\rho_{X_1}} + (1 - \beta_{X_1}) K_G^{-\rho_{X_1}} \}^{-\frac{1}{\rho_{X_1}}} \right]^{1-\eta_{X_1}} \tag{A2}$$

$$X_1 = \alpha_{ED_1} [\beta_{ED_1} E_1^{\rho_{ED_1}} + (1 - \beta_{ED_1}) D_1^{\rho_{ED_1}}]^{\frac{1}{\rho_{ED_1}}} \tag{A3}$$

$$X_2 = V_2 + \sum_{i=1}^{4} a_{i2} X_2 \tag{A4}$$

$$V_2 = U_2^{\eta_{X_2}} \tag{A5}$$

$$X_3 = V_3 + \sum_{i}^{4} a_{i3} X_3 \tag{A6}$$

$$J_L(S_3, K_3) = \alpha_{X_3L} [\beta_{X_3L} S_3^{-\rho_{X_4L}} + (1 - \beta_{X_3L}) K_3^{-\rho_{X_3L}}]^{-\frac{1}{\rho_{X_3L}}} \tag{A7}$$

$$J_H(J_L, U_3) = \alpha_{X_3H} \{ \beta_{X_3H} J_L^{-\rho_{X_3H}} + (1 - \beta_{X_3H}) U_3^{-\rho_{X_3H}} \}^{-\frac{1}{\rho_{X_3H}}} \tag{A8}$$

$$V_3(J_H, K_G) = \alpha_{X_3} \left[\beta_{X_3} J_H^{-\rho_{X_3}} + (1 - \beta_{X_3}) \{ \frac{K_G}{URB^{dc_3}} \}^{-\rho_{X_3}} \right]^{-\frac{1}{\rho_{X_3}}} \tag{A9}$$

$$X_3 = \alpha_{ED_3} [\beta_{ED_3} E_3^{\rho_{ED_3}} + (1 - \beta_{ED_3}) D_3^{\rho_{ED_3}}]^{\frac{1}{\rho_{ED_3}}} \tag{A10}$$

$$X_4 = V_4 + \sum_{i=1}^{4} a_{i4} X_4 \tag{A11}$$

$$V_4 = (W_{UG} U_4 + W_{SG} S_4) / PV_4 \tag{A12}$$

WAGES AND EMPLOYMENT

$$U_1^d = \left\{ V_1^{1 + \frac{\rho_{X_1}}{1-\eta_{X_1}}} \frac{1 - \eta_{X_1}}{\omega_1} \cdot \frac{\beta_{X_1}}{\alpha_{X_1}^{\rho_{X_1}}} \right\}^{\frac{1}{1+\rho_{X_1}}} \tag{A13}$$

$$U_R^s = U_1^d(V_1, \frac{W_1}{PV_1}) \tag{A14}$$

$$U_R^s = U_{R,-1}^s(1+g_R) - MIG \tag{A15}$$

$$w_U^e = \frac{\theta_U W_{M,-1} + (1-\theta_U)\eta_{X_2}^{-1} W_{2,-1}}{P_{UU,-1}} \tag{A16}$$

$$\theta_U = \frac{U_{3,-1}}{U_{F,-1}^s - U_{4,-1}} \tag{A17}$$

$$w_A^e = \frac{W_{1,-1}}{P_{R,-1}} \tag{A18}$$

$$\frac{MIG}{U_{R,-1}} = \left(\frac{w_U^e}{w_A^e}\right)^{\sigma_M} \tag{A19}$$

$$U_3^d = J_H \left(\frac{P_H^J}{(1+ptx_U)W_M - ES_U} \cdot \frac{\beta_{X_3H}}{\alpha_{X_3H}^{\rho_{X_3H}}} \right)^{\sigma_{X_3H}} \tag{A20}$$

$$w_F^e = \frac{U_{3,-1}^d}{U_{F,-1}^s - U_{3,-1}} \left(\frac{W_{M,-1}}{P_{UU,-1}}\right) \tag{A21}$$

$$U_F^s = U_{F,-1}^s \left(\frac{w_F^e}{P_{UU,-1}^{-1} y_{2,-1}^m} \right)^{\sigma_F} \tag{A22}$$

$$UNE_U = 1 - \frac{(U_3^d + U_4)}{U_F^s} \tag{A23}$$

$$U_2^s = U_U^s - U_F^s \tag{A24}$$

$$W_2 = \eta_{X_2} \left(\frac{PV_2V_2}{U_2^s}\right) \tag{A25}$$

$$U_U^s = U_{U,-1}^s(1+g_U) + MIG - SKL \tag{A26}$$

$$URB = U_U^s + S \tag{A27}$$

$$W_i = \omega_i P_{UU}^{idx_i}, \qquad i = UG, M \tag{A28}$$

$$W_{SG} = \omega_{SG} P_{US} \tag{A29}$$

$$S_3^d = J_L \left\{ \frac{P_L^J}{W_S} \cdot \frac{\beta_{X_3L}}{\alpha_{X_3L}^{\rho_{X_3L}}} \right\}^{\sigma_{X_3L}} \tag{A30}$$

$$W_S = P_{US}\frac{UNE_S^{-\phi_1} f_S^{-\phi_2}\omega_{SG}^{\phi_3}}{1-\nu/(1-\nu)\sigma_{X_3L}} \tag{A31}$$

$$W_S = P_L^J \cdot UNE_S^{-\phi_1}\left\{(\frac{\beta_{X_3L}}{\alpha_{X_3L}^{\rho_{X_3L}}})(\frac{J_L}{S_3})^{1+\rho_{X_3L}} - f_S\right\} \tag{A32}$$

$$UNE_S = 1 - \frac{(S_3^d + S_G)}{S} \tag{A33}$$

$$S_G = S_4 + S_G^E \tag{A34}$$

$$S = (1-\delta_S)S_{-1} + SKL \tag{A35}$$

$$SKL = [\beta_E(\varphi S_G^E)^{-\rho_E} + (1-\beta_E)K_E{}^{-\rho_E}]^{-\frac{1}{\rho_E}} \tag{A36}$$

$$\varphi = \left\{1 + \kappa \exp\left[-\frac{(1-UNE_{S,-1})W_{S,-1}}{W_{SG,-1}}\right]\right\}^{-1} \tag{A37}$$

$$\varphi = 1 - \varphi_m\left[\frac{(1-UNE_{S,-1})W_{S,-1}}{W_{SG,-1}}\right]^{\kappa} \tag{A38}$$

SUPPLY AND DEMAND

$$X_2 = Q_2^s \tag{A39}$$

$$X_4 = Q_4^s \tag{A40}$$

$$Q_1^s = \alpha_{Q_1}\{\beta_{Q_1}M_1^{-\rho_{Q_1}} + (1-\beta_{Q_1})D_1^{-\rho_{Q_1}}\}^{-\frac{1}{\rho_{Q_1}}} \tag{A41}$$

$$Q_3^s = \alpha_{Q_3}\{\beta_{Q_3}M_3^{-\rho_{Q_3}} + (1-\beta_{Q_3})D_3^{-\rho_{Q_3}}\}^{-\frac{1}{\rho_{Q_3}}} \tag{A42}$$

$$Q_i^d = C_i + INT_i, \quad \text{for } i = 1,2,4 \tag{A43}$$

$$Q_3^d = C_3 + G_3 + Z_3 + INT_3 \tag{A44}$$

$$INT_j = \sum_{i=1}^{4} a_{ji}X_i, \qquad \text{for } j = 1,...4 \tag{A45}$$

$$G_3 = G_C + Z_G \tag{A46}$$

$$C_{ih} = x_{ih} + \frac{cc_{ih}(CO_h - \sum_{i=1}^{4} PC_i x_{ih})}{PC_i} \tag{A47}$$

$$C_i = \sum_h C_{ih}, \quad i = 1, ...4 \tag{A48}$$

$$Z_3 = Z_P \tag{A49}$$

TRADE

$$\frac{E_1}{D_1} = \left(\frac{PE_1}{PD_1} \cdot \frac{1 - \beta_{T_1}}{\beta_{T_1}} \right)^{\sigma_{T_1}} \tag{A50}$$

$$\frac{E_3}{D_3} = \left(\frac{PE_3}{PD_3} \cdot \frac{1 - \beta_{T_3}}{\beta_{T_3}} \right)^{\sigma_{T_3}} \tag{A51}$$

$$M_1 = D_1 \left(\frac{PD_1}{PM_1} \cdot \frac{\beta_{Q_1}}{1 - \beta_{Q_1}} \right)^{\sigma_{Q_1}} \tag{A52}$$

$$M_3 = D_3 \left(\frac{PD_3}{PM_3} \cdot \frac{\beta_{Q_3}}{1 - \beta_{Q_3}} \right)^{\sigma_{Q_3}} \tag{A53}$$

PRICES

$$PV_i = V_i^{-1} \left\{ PX_i(1 - atx_i) - \sum_{j=1}^{4} a_{ji} PC_j \right\} X_i \quad \text{for } i = 1, ...4 \tag{A54}$$

$$PE_1 = wpe_1 ER \tag{A55}$$

$$PE_3 = wpe_3 ER \tag{A56}$$

$$PM_1 = wpm_1(1 + itm_1)ER \tag{A57}$$

$$PM_3 = wpm_3(1 + itm_3)ER \tag{A58}$$

$$PX_1 = \frac{PD_1 D_1 + PE_1 E_1}{X_1} \tag{A59}$$

$$PX_3 = \frac{PD_3 D_3 + PE_3 E_3}{X_3} \tag{A60}$$

$$PQ_1 = \frac{M_1 PM_1 + D_1 PD_1}{Q_1^d} \tag{A61}$$

$$PC_1 = (1 + six_1)PQ_1 \tag{A62}$$

$$PQ_3 = \frac{M_3 PM_3 + D_3 PD_3}{Q_3^d} \tag{A63}$$

$$PC_3 = (1 + six_3)PQ_3 \tag{A64}$$

$$PQ_2 = PD_2 = PX_2 = PC_2 \tag{A65}$$

$$PQ_4 = PD_4 = PX_4 = PC_4 \tag{A66}$$

$$P_H^J = \frac{P_L^J J_L + [(1+ptx_U)W_M - ES_U]U_3}{J_H} \tag{A67}$$

$$P_L^J = \frac{PR_3 + W_S S_3}{J_L} \tag{A68}$$

$$P_K = \frac{PC_3 Z_3}{Z} = PC_3 \tag{A69}$$

$$P_R = \sum_i \theta_i^R PQ_i \tag{A70}$$

$$P_{UU} = \sum_i \theta_i^U PC_i, \quad P_{US} = \sum_i \theta_i^S PC_i \tag{A71}$$

INCOME

$$PR_1 = PV_1 V_1 - W_1 U_1 \tag{A72}$$

$$PR_2 = PV_2 V_2 - W_2 U_2 \tag{A73}$$

$$PR_3 = PV_3(V_3 - FC) - [(1+ptx_U)W_M - ES_U]U_3 - W_S S_3 \tag{A74}$$

$$FC = f_U \max(0, U_{3,-1} - U_3) + f_S \max(0, S_{3,-1} - S_3) \tag{A75}$$

$$YH_a = PV_1 V_1 + \gamma_a TR \tag{A76}$$

$$YH_b = PV_2 V_2 + \gamma_b TR \tag{A77}$$

$$YH_c = W_M U_3 + W_{UG} U_4 + PV_3 f_U \max(0, U_{3,-1} - U_3) + \gamma_c TR \tag{A78}$$

$$YH_d = W_S S_3 + W_{SG} S_G + PV_3 f_S \max(0, S_{3,-1} - S_3) + \gamma_d TR \tag{A79}$$

$$NPR_3 = (1 - itx_f)PR_3 - i^* ER \cdot FL_{3,-1} \tag{A80}$$

$$YH_e = (1-\chi)NPR_3 + \gamma_e TR \tag{A81}$$

$$SAV_h = sr_h(1 - itx_h)YH_h \tag{A82}$$

$$CO_h = (1 - sr_h)(1 - itx_h)YH_h \tag{A83}$$

$$K_3^* = \frac{PR_3}{P_K} \cdot \frac{(1 - itx_f)}{i^* + \delta_3 - \Delta P_K / P_{K,-1}} \tag{A84}$$

$$\frac{Z_P}{K_{3,-1}} = z_0 \left\{ \frac{K_3^*}{K_{3,-1}} \right\}^{\sigma z} \tag{A85}$$

$$K_3 = K_{3,-1}(1 - \delta_3) + Z_{P,-1} \tag{A86}$$

$$P_K Z_P = \chi NPR_3 + \sum_h SAV_h + GBAL + ER(\Delta FL_3 + \Delta FL_G) \quad \text{(A87)}$$

$$NW_3 = NW_{3,-1} + P_K \Delta K_3 - ER \cdot \Delta FL_3 + \Delta P_K K_{3,-1} \quad \text{(A88)}$$

PUBLIC SECTOR

$$GBAL = TAX - TR - W_{SG} S_G^E - ES_U U_3^d - PC_3(G_C + Z_G) - i_G^* ER \cdot FL_{G,-1} \quad \text{(A89)}$$

$$TAX = \sum_{i=1,3} itm_i(ER \cdot wpm_i M_i) + ptx_U W_M U_3 + itx_f PR_3 + \sum_{i=1}^{4} atx_i PX_i X_i + \sum_h itx_h YH_h + \sum_{i=1,3} stx_i PQ_i Q_i \quad \text{(A90)}$$

$$Z_G = I_R + I_E + I_H \quad \text{(A91)}$$

$$K_j = K_{j,-1}(1 - \delta_j) + I_{j,-1}, \quad j = E, H, R \quad \text{(A92)}$$

$$K_G = \alpha_G \{\beta_G K_R^{-\rho_G} + (1 - \beta_G) K_H^{-\rho_G}\}^{-\frac{1}{\rho_G}} \quad \text{(A93)}$$

BALANCE OF PAYMENTS

$$\sum_{i=1,3} (wpe_i E_i - wpm_i M_i) - i^*(FL_{G,-1} + FL_{3,-1}) + \Delta FL_G + \Delta FL_3 = 0 \quad \text{(A94)}$$

Appendix B
Variable Names and Definitions

Endogenous Variables[34]

Name in text	Definition
AVC_3	Average variable cost in private production
C_{ih}	Consumption of good i by household h
C_i	Aggregate consumption of good i (by all households)
CO_h	Total consumption by household h
D_i	Domestic demand for good $i = 1, 3$
E_i	Exports of good $i = 1, 3$
ES_U	Nominal employment subsidy on unskilled labor
FC	Total firing costs
f_S	Real firing cost per skilled worker
f_U	Real firing cost per unskilled worker
G_3	Government spending on private urban goods
$GBAL$	Overall government fiscal balance
IK	After-tax rate of return on private physical capital
INT_i	Intermediate good demand for good i
J_H	Composite input from J_L and unskilled labor
J_L	Composite input from capital and skilled labor
K_E	Public capital in education
K_G	Stock of public capital (infrastructure and health)
K_H	Public capital in health
K_R	Public capital in infrastructure
K_3	Private physical capital
K_3^*	Desired stock of private physical capital
M_i	Imports of good $i = 1, 3$
m_S	Marginal product of a skilled worker in private production
MIG	Rural-urban migration flows
NPR_3	Net (after-tax) profits of private urban formal sector firms
NW_3	Net worth of private urban formal sector firms
Ω_S	Unemployment benefit for skilled workers

[34]The index i (respectively, h) is used below to refer to all production sectors (household groups, respectively), that is, $1, 2, 3, 4$ (a, b, c, d, e, respectively), unless otherwise indicated.

φ	Productivity of public sector workers in education
φ_m	Minimum effort level of public sector workers in education
P_R	Rural price index
PC_i	Tax-inclusive domestic sales price of good $i = 1, 3$
PD_i	Domestic price of domestic sales of good i
PE_i	Export price for good $i = 1, 3$
P_K	Price of capital
PM_i	Import price for good $i = 1, 3$
PQ_i	Composite price of good i
PR_i	Profits by firms producing good i
P_H^J	Price of J_H
P_L^J	Price of J_L
P_{US}	Urban skilled price index
P_{UU}	Urban unskilled price index
PV_i	Value added price of good i
PX_i	Gross output price of good i
Q_i^d	Aggregate demand for good i
Q_i^s	Quantity supplied of good i
S	Stock of skilled workers
S_3	Skilled labor employed in the private urban formal sector
S_3^T	Union's skilled employment target
SAV_h	Saving by household h
sr_h	Saving rate for household h
SKL	Change in the number of skilled workers
TR	Public transfers to households
TAX	Total tax revenues
TVC_3	Total variable costs in private urban production
U_h	Stone-Geary utility function for household h
U_i	Unskilled labor employed in sector i
U_F^s	Unskilled labor supply in the urban formal sector
U_R	Unskilled workers in rural sector
U_U^s	Total supply of unskilled workers in the urban sector
U_i^d	Demand for labor in sector $i = 1, 2, 3$
U_2^s	Supply of labor in the informal sector
U_R^s	Labor supply in the rural sector
UNE_U	Unskilled unemployment rate in the urban formal sector
UNE_S	Skilled unemployment rate

URB	Total urban population (skilled and unskilled)
V_i	Value added in sector i
W_i	Nominal wage in sector $i = 1, 2$
w_i	Real wage rate in sector $i = 1, 2$
w_A^e	Expected rural consumption real wage
w_F^e	Expected real wage in the formal economy
w_I^e	Expected real wage in the informal economy
w_U^e	Expected unskilled urban real wage
W_M	Minimum wage (nominal terms)
W_S	Nominal skilled wage in the private formal sector
w_S	Real skilled wage in the private formal sector
w_S^C	Consumption real wage
w_S^{CT}	Union's real consumption wage target
W_{SG}	Nominal skilled wage in the public sector
w_{SG}	Real skilled wage in the public sector
W_{UG}	Nominal unskilled wage in the public sector
x_{ih}	Subsistence level of consumption of good i by household h
X_i	Gross production of good i
YH_h	Income of household h
y_2^m	Average income in the informal sector (before transfers)
Z_G	Real public investment expenditure
Z_P	Real private investment expenditure ($= Z_3$)

Exogenous Variables

Name in text	Definition
atx_i	Indirect taxation rate of output in sector i
ε	Rate of depreciation of the nominal exchange rate
ER	Nominal exchange rate
FL_G	Foreign borrowing by government
FL_3	Foreign borrowing by private urban formal firms
G_C	Government consumption (excluding wages and salaries)
g_R	Population growth in rural sector
g_U	Population growth in urban sector
i^*	Interest rate on private foreign borrowing
i_G^*	Interest rate paid on public foreign borrowing
I_E	Public investment in education
I_H	Public investment in health
I_R	Public investment in infrastructure
itx_f	Corporate income tax rate
itx_h	Income tax rate for household h
mk	Markup rate, private urban formal firms
ptx_U	Payroll tax rate on unskilled labor, private formal urban sector
χ	Rate of retained net profits, private formal urban sector
S_4	Skilled workers in production of public services
S_G	Total number of skilled workers in the public sector
S_G^E	Skilled workers in public production of education
stx_i	Sales tax rate on good i ($stx_2 = 0$)
tm_i	Import tariff on good $i = 1, 3$
U_4	Unskilled workers in public sector
wpe_i	World price of exports, $i = 1, 3$
wpm_i	World price of imports, $i = 1, 3$

Parameters

Name in text	Definition
a_{ij}	Input-output coefficients
α_G	Shift parameter for public capital
α_{Qi}	Shift parameter in composite good $i = 1, 3$
α_{ED1}	Shift parameter in agricultural production function
α_{ED3}	Shift parameter in CET function for private formal urban good
α_{Xi}	Shift parameter in production of $i = 1, 3$
α_{X3H}	Shift parameter in unskilled, skilled/capital composite input
α_{X3L}	Shift parameter in skilled/capital composite input
β_E	Weighting parameter in the skills acquisition function
β_G	Shift parameter for public capital
β_{Qi}	Shift parameter in composite good $i = 1, 3$
β_{ED1}	Shift parameter in agricultural production function
β_{ED3}	Shift parameter in CET function for private formal urban good
β_{Xi}	Shift parameter in production of good $i = 1, 3$
β_{X3H}	Share parameter in unskilled, skilled/capital composite input
β_{X3L}	Share parameter in skilled/capital composite input
cc_{ih}	Shares of good i in household h's total consumption
dc_3	Congestion parameter, private formal urban good
δ_3	Depreciation rate of private capital
δ_E	Depreciation rate of public capital in education
δ_H	Depreciation rate of public capital in health
δ_R	Depreciation rate of public capital in infrastructure
δ_S	Rate of depreciation or "de-skilling" of the skilled labor force
η_{X1}	Coefficient of returns to scale
η_{X2}	Parameter in the value added function for urban informal good
γ_h	Share of public transfers allocated to household h
ϕ_j	Parameters in skilled target wage equation, $j = 1, 2, 3$
ρ_E	Parameter in the skills acquisition function
ρ_G	Substitution parameter for public capital
ρ_{Qi}	Substitution parameter in composite good $i = 1, 3$
ρ_{ED1}	Parameter in agricultural production function
ρ_{ED3}	Substitution parameter between exports and domestic sales
ρ_{Xi}	Substitution parameter in production of good $i = 1, 3$

ρ_{X3H}	Substitution parameter between unskilled, and skilled/capital composite input
ρ_{X3L}	Substitution parameter between skilled labor- private capital
σ_F	Elasticity of unskilled labor flows with respect to the expected formal-informal wage differential
σ_M	Elasticity of migration flows to rural-urban wage differentials
σ_{Qi}	Elasticity of composite good $i = 1, 3$
σ_{EDi}	Elasticity of transformation between exports and domestic sales, $i = 1, 3$
σ_{X3H}	Elasticity of substitution between unskilled workers and composite input of skilled workers and private capital
σ_{X3L}	Elasticity of substitution between skilled workers-private capital
σ_Z	Parameter in the investment function for the private sector
θ_U	Share of urban unskilled workers employed in formal sector
θ_i^R	Weight of good i in the price index of the rural sector
θ_i^S	Weight of good i in the price index for urban skilled workers
θ_i^U	Weight of good i in the price index for urban unskilled workers
υ	Weight of wage deviations in Union's utility function
z_0	Shift parameter in the investment function in the private sector

Appendix C
Calibration and Parameter Values

This appendix presents the characteristics of the data underlying the calibration procedure for the Mini-IMMPA prototype described in the text.[35] The basic data set consists of a Social Accounting Matrix (SAM) and a set of initial levels and lagged variables. The mapping between Mini-IMMPA variables and the SAM data framework is set out in Table C1. The SAM encompasses 27 accounts including production and retail sectors (4 accounts), labor production factors and profits (3 accounts), enterprises (1 account), households (5 accounts), government current expenditures and taxes (9 accounts), government investment expenditures (3 accounts), private investment spending (1 account), and the rest of the world (1 account). The actual SAM data are presented in Table C2. The data satisfy the double-entry accounting principle and can therefore be used to initialize model variables and calibrate level parameters, such as effective tax rates.

The characteristics of the SAM data and other data (including initial labor market quantities and debt and capital stocks) are summarized in the following. On the output side, agriculture and the informal sector account for respectively 12 and 35 percent of total output. On the demand side, private current and capital expenditures account for 78 percent of GDP, whereas overall government expenditures account for 18 percent of GDP. The economy has a balanced current account but runs a trade surplus, amounting to 4 percent of GDP, to finance foreign interest payments. This structure of production and final demand characterize fairly well a lower middle-income economy with moderate potential for agricultural production.

Total investment expenditures amount to 22 percent of GDP, and the private sector account for two-thirds of these outlays. This implies that investment spending accounts for 19 percent of private expenditures, and 40 percent of public expenditures. The public sector investment budget allocates 30 percent of expenditures to investment in the health sector, 30 percent to investment in the education sector, and 40 percent to investment in infrastructure. Furthermore, the public sector wage bill makes up 30 percent of overall public sector expenditures. In the base period the government is assumed to run a balanced budget, and therefore does not resort to domestic or foreign borrowing. Sales taxes and import tariffs make up for more

[35] This Appendix was drafted by Henning Jensen.

than 70 percent of total government revenues, whereas private income and corporate taxes account for less than 20 percent of revenues. This structure of tax revenue is a common feature of many developing economies, low- and middle-income.

The trade balance is dominated by non-agricultural imports and exports. Agricultural exports account for only 8 percent of total export earnings, whereas non-agricultural imports account for 92 percent of total imports. The level of trade openness, measured by the ratio of the sum of imports and exports to GDP, amounts to a moderate 40 percent. Because the economy runs a balanced current account in the base period, there are no private and public foreign borrowing. Nevertheless, the stock of external debt in the base period amounts to 51 percent of GDP (or 233 percent of export earnings), whereas foreign interest payments amount to 4 percent of GDP (or 18 percent of exports earnings). The hypothetical country considered has therefore a significant debt burden initially.

Looking at the labor market, 29 percent of the total labor force is living in rural areas, whereas the rest is concentrated in urban areas. Altogether, 47 percent of the workers are employed in some kind of urban informal occupation, whereas only 22 percent of the labor force is employed in the urban formal sector. Open unemployment among formal urban workers amounts to 2 percent of the total labor force. The formal labor force consists of 58 percent of unskilled workers and 42 percent of skilled workers, and unemployment rates are 10 percent among formal unskilled labor and 8 percent among skilled labor. Migration from rural to urban areas amounts to 1.3 percent of the rural population, and the urban-rural wage differential amounts to 54 percent of the rural wage. In comparison, unskilled labor migration from the informal to the formal sector amounts to 0.8 percent of the informal sector labor force, whereas the formal-informal wage differential amounts to 106 percent of the informal wage.

A set of 17 elasticity parameters has to be estimated (or "guesstimated"), as they cannot be derived from the calibration procedure. These parameters include CES substitution elasticities in rural agricultural and private formal production (4 parameters); CES Armington elasticities and CET transformation elasticities for aggregating domestic composite goods and transforming domestic production (4 parameters); elasticities related to rural-urban, and formal-informal sector migration (2 parameters); elasticities related to the computation of ordinary and congested government capital (2 parameters), the elasticity of effort by teachers and the elasticity of substitution between

labor and capital in skill upgrading (2 parameters); the elasticities related to determination of skilled labor wages (2 parameters); and the elasticity of investment with respect to the desired private capital stock (1 parameter). In addition, a set of minimum consumption levels (15 parameters) has to be determined, because they cannot be derived from the calibration procedure either.

The substitution elasticity between labor and government capital in rural production is set at 0.7, whereas elasticities in the nested private formal sector production structure ranges from 0.7 between skilled labor and capital to 1.2 between the skilled labor-capital bundle and unskilled labor. Import and export elasticities are uniformly set at 0.7 for agriculture and 1.5 for the urban private formal sector. This is again meant to reflect a lower middle-income economy with low agricultural potential. The elasticity of rural-urban migration with respect to the relative rural-urban wage-differential is set at 0.4, whereas the elasticity of formal-informal migration with respect to the formal-informal wage ratio is set at 0.8.

In relation to the computation of public sector capital, the substitution parameter between infrastructure and health capital stocks are set at 0.5, whereas congestion is assumed to be absent by setting the elasticity to zero. The substitution elasticity between teachers and public capital in education in the production of skilled labor is set to 0.3, whereas the effort elasticity with respect to the relative wage ratio (using the specification in Agénor and Aizenman (1999)) is set to 0.8. Furthermore, skilled labor wages in the urban private formal sector is only assumed to be affected by the skilled unemployment rate. Accordingly, the private skilled wage elasticity with respect to unemployment is set at −2.0, whereas the elasticity with respect to the skilled labor-capital bundle is assumed to be zero.

Turning to the specification of private capital formation, the investment elasticity with respect to the desired growth rate of the private capital stock is set at 0.3. This reflects an economy facing structural difficulties in the process of capital accumulation. Finally, minimum household consumption levels were uniformly assumed to amount to 10 percent of initial good-specific consumption levels.

Among the remaining set of parameters, the foreign interest rate on private borrowing is calibrated to 3.8 percent, whereas the public foreign interest rate is calibrated to 4.9 percent. In addition, the initial depreciation rates are calibrated to 6.4 percent for private capital and 3.9-5.8 percent for public capital (depending on whether investment is in education, health, or

infrastructure). Turning to the government budget, output and value added tax rates range from 3.0-3.7 percent, whereas the tax rate on sales of the urban private formal sector and the payroll tax rate paid by firms in that sector are calibrated to respectively 12.1 and 20.1 percent. Import tariffs range from 34 percent on private formal sector goods to 167 percent on agricultural goods, reflecting a country with significant protection on agriculture. Finally, the corporate income tax rate is set as 7.6 percent, whereas income tax rates on households range from 2.2-3.9 percent for rural agricultural and urban unskilled groups, to 9.6-12.5 percent for the urban skilled group and capitalists-rentiers. As noted in the text, workers in the urban informal sector do not pay income taxes.

References

Agénor, Pierre-Richard, "The Labor Market and Economic Adjustment," *IMF Staff Papers*, 43 (June 1996), 261-335.

——, "Fiscal Adjustment and Labor Market Dynamics in an Open Economy," unpublished, the World Bank (March 1999). Forthcoming, *Journal of Development Economics.*

——, *The Economics of Adjustment and Growth*, Academic Press (San Diego, Cal.: 2000). Second edition forthcoming, MIT Press.

——, "Macroeconomic Adjustment and the Poor: Analytical Issues and Cross-Country Evidence," Policy Research Working Paper No. 2788, the World Bank (February 2002). Forthcoming, *Journal of Economic Surveys.*

——, "Unemployment-Poverty Trade-offs," work in progress, the World Bank (May 2003*a*).

——, *The Analytics of Micro-Macro Linkages for the Design of Adjustment and Poverty Reduction Strategies*, work in progress, the World Bank (May 2003*b*).

Agénor, Pierre-Richard, and Joshua Aizenman, "Macroeconomic Adjustment with Segmented Labor Markets," *Journal of Development Economics*, 58 (April 1999), 277-96.

Agénor, Pierre-Richard, and Karim El Aynaoui, "Labor Market Policies and Unemployment in Morocco: A Quantitative Analysis," unpublished, the World Bank (March 2003).

Agénor, Pierre-Richard, Reynaldo Fernandes, Eduardo Haddad, and Dominique van der Mensbrugghe, "Analyzing the Impact of Adjustment Policies on the Poor: An IMMPA Framework for Brazil," unpublished, the World Bank (January 2003).

Agénor, Pierre-Richard, and Michael Grimm, "Linking Representative Household Models with Household Surveys: Implications for Quantifying Poverty Reduction Strategies," work in progress, the World Bank (May 2003).

Agénor, Pierre-Richard, Alejandro Izquierdo, and Hippolyte Fofack, "IMMPA: A Quantitative Macroeconomic Framework for the Analysis of Poverty Reduction Strategies," unpublished, the World Bank (March 2003).

Agénor, Pierre-Richard, and Peter J. Montiel, *Development Macroeconomics*, Princeton University Press, 2nd ed. (Princeton, New Jersey: 1999).

Agénor, Pierre-Richard, Mustapha K. Nabli, Tarik Yusef, and Henning Jensen, "Labor Market Reforms, Growth, and Unemployment in Labor-Exporting MENA Countries," work in progress, the World Bank (May 2003).

Ahmed, Habib, and Stephen M. Miller, "Crowding-Out and Crowding-In Effects of the Components of Government Expenditure," *Contemporary Economic Policy*, 18 (January 2000), 124-33.

Bean, Charles, "European Unemployment: A Survey," *Journal of Economic Literature*, 32 (June 1994), 573-619.

Bertola, Guiseppe, "Job Security, Employment and Wages," *European Economic Review*, 34 (June 1990), 851-79.

Besley, Timothy, and Robin Burgess, "Can Labor Regulation Hinder Economic Performance? Evidence from India," unpublished, London School of Economics (February 2002).

Betcherman, Luinstra, and Ogawa, "Labor Market Regulation: International Experience in Promoting Employment and Social Protection," Social Protection Working Paper No. 0128, the World Bank (November 2001).

Blanchard, Olivier-Jean, and Francesco Giavazzi, "Macroeconomic Effects of Regulation and Deregulation in Goods and Labor Markets," Working Paper No. 8120, National Bureau of Economic Research (February 2001).

Booth, Alison L., *The Economics of the Trade Union*, Cambridge University Press (Cambridge: 1995).

——, "An Analysis of Firing Costs and their Implications for Unemployment Policy," in *Unemployment Policy: Government Options for the Labor Market*, ed. by Dennis Snower and Gillermo de la Dehesa, Cambridge University Press (Cambridge: 1997).

Cahuc, Pierre, and Philippe Michel, "Minimum Wage, Unemployment and Growth," *European Economic Review,* 40 (August 1996), 1463-82.

Coe, David T., and Dennis J. Snower, "Policy Complementarities: The Case for Fundamental Labor Market Reform," *IMF Staff Papers*, 44 (March 1997), 1-35.

Creedy, John, and Ian McDonald, "Models of Trade Union Behavior: A Synthesis," *Economic Record*, 67 (December 1991), 346-59.

Dabalen, Andrew, "Alternative Views of the Labor Market in sub-Saharan Africa: A Review," unpublished, the World Bank (June 2000).

Dessy, Sylvain, and Stéphane Pallage, "Taxes, Inequality and the Size of the Informal Sector," *Journal of Development Economics*, 70 (February 2003), 225-33.

Devarajan, Shanta, Hafez Ghanem, and Karen Thierfelder, "Economic Reforms and Labor Unions: A General-Equilibrium Analysis Applied to Bangladesh and Indonesia," *World Bank Economic Review*, 11 (January 1997), 145-70.

Dewatripont, Mathias, and Gilles Michel, "On Closure Rules, Homogeneity, and Dynamics in Applied General Equilibrium Models," *Journal of Development Economics*, 26 (June 1987), 65-76.

Drèze, Jacques, Edmond Malinvaud, and others, "Growth and Employment: The Scope of a European Initiative," *European Economic Review*, 38 (April 1994), 489-504.

Fallon, P. R., and R. E. B. Lucas, "Job Security Regulations and the Dynamic Demand for Industrial Labor in India and Zimbabwe," *Journal of Development Economics*, 40 (April 1993), 241-75.

Gavin, Michael, "Labor Market Rigidities and Unemployment: The Case of Severance Costs," International Finance Discussion Paper No. 184, Federal Reserve Board (June 1986).

Ghura, Dhaneshwar, and Barry Goodwin, "Determinants of Private Investment: A Cross-Regional Empirical Investigation," *Applied Economics*, 32 (November 2000), 1819-29.

Gottfries, Nils, and Barry McCormick, "Discrimination and Open Unemployment in a Segmented Labour Market," *European Economic Review*, 39 (January 1995), 1-15.

Gregg, Paul, and Alan Manning, "Labour Market Regulation and Unemployment," in *Unemployment Policy: Government Options for the Labor Market*, ed. by Dennis Snower and Guillermo de la Dehesa, Cambridge University Press (Cambridge: 1997).

Hamermesh, David, *Labor Demand*, Princeton University Press (Princeton, New Jersey: 1993).

Heckman, James J., and Carmen Pagés, "The Cost of Job Security Regulation: Evidence from Latin American Labor Markets," *Journal of the Latin American and Caribbean Economic Association*, 1 (Fall 2000), 109-54.

Hendricks, Lutz, "Equipment Investment and Growth in Developing Countries," *Journal of Development Economics*, 61 (April 2000), 335-64.

Ihrig, Jane, and Karine S. Moe, "Tax Policies and Informal Employment: The Asian Experience," unpublished, Board of Governors of the Federal Reserve System (November 2000).

——, "Lurking in the Shadows: The Informal Sector and Government Policy," unpublished, Board of Governors of the Federal Reserve System (June 2001).

Jimenez, Emmanuel, "Human and Physical Infrastructure: Public Investment

and Pricing Policies in Developing Countries, in *Handbook of Development Economics*, ed. by Jere Behrman and T. N. Srinivasan, Vol. 3B, North Holland (Amsterdam: 1995).

Johnson, Simon, Daniel Kaufman, and Zoido-Lobaton, "Regulatory Discretion and the Unofficial Economy," *American Economic Review*, 88 (May 1998), 387-92.

Karni, "Optimal Unemployment Insurance: A Guide to the Literature," Social Protection Discussion Paper No. 9906, the World Bank (January 1999).

Konan, Denise E., and Keith E. Maskus, "Joint Trade Liberalization and Tax Reform in a Small Open Economy: The Case of Egypt," *Journal of Development Economics*, 61 (April 2000), 365-92.

Kugler, Adriana, "The Incidence of Job Security Legislation on Labor Market Flexibility and Compliance in Colombia," Working Paper No. R-393, Inter-American Development Bank (May 2000).

Lindauer, David D., "Labor Market Reforms and the Poor," unpublished, the World Bank (October 1999).

Loayza, Norman V., "The Economics of the Informal Sector: A Simple Model and Some Empirical Evidence from Latin America," Carnegie-Rochester Conference Series on Public Policy, Vol. 45 (June 1996).

Lucas, Robert E. B., "Internal Migration in Developing Countries," in *Handbook of Population and Family Economics*, ed. by Mark Rosenzweig and Oded Stark, Vol. 1B, Elsevier (Amsterdam: 1997).

Maechler, Andréa M., and David Roland-Holst, "Labor Market Structure and Conduct," in *Applied Methods for Trade Policy Analysis*, ed. by Joseph F. Francois and Kenneth A. Reinert, Cambridge University Press (Cambridge: 1997).

McCormick, Barry, "Theory of Signalling during Job Search, Employment Efficiency, and 'Stigmatised' Jobs," *Review of Economic Studies*, 57 (April 1990), 299-313.

Pisauro, Giuseppe, "The Effect of Taxes on Labour in Efficiency Wage Models," *Journal of Public Economics*, 46 (December 1991), 329-45.

Sanchez-Robles, B., "Infrastructure Investment and Growth: Some Empirical Evidence," *Contemporary Economic Policy*, 16 (January 1998), 98-108.

Sanz, Ismael, and Francisco J. Velázquez, "The Composition of Public Expenditure and Growth: Different Models of Government Expenditure Distribution by Functions," unpublished, University of Madrid (August 2001).

Sarte, Pierre-Daniel, "Informality and Rent-Seeking Bureaucracies in a Model of Long-Run Growth," *Journal of Monetary Economics*, 46 (August 2000),

173-97.

Schneider, Friedrich, and Dominik Enste, "Shadow Economies: Size, Causes, and Consequences," *Journal of Economic Literature*, 38 (March 2000), 77-114.

Lindbeck, Assar, and Dennis J. Snower, "Insiders Versus Outsiders," *Journal of Economic Perspectives*, 15 (Winter 2001), 165-88.

Tanzi, Vito, and Howell H. Zee, "Fiscal Policy and Long-Run Growth," *IMF Staff Papers*, 44 (June 1997), 179-209.

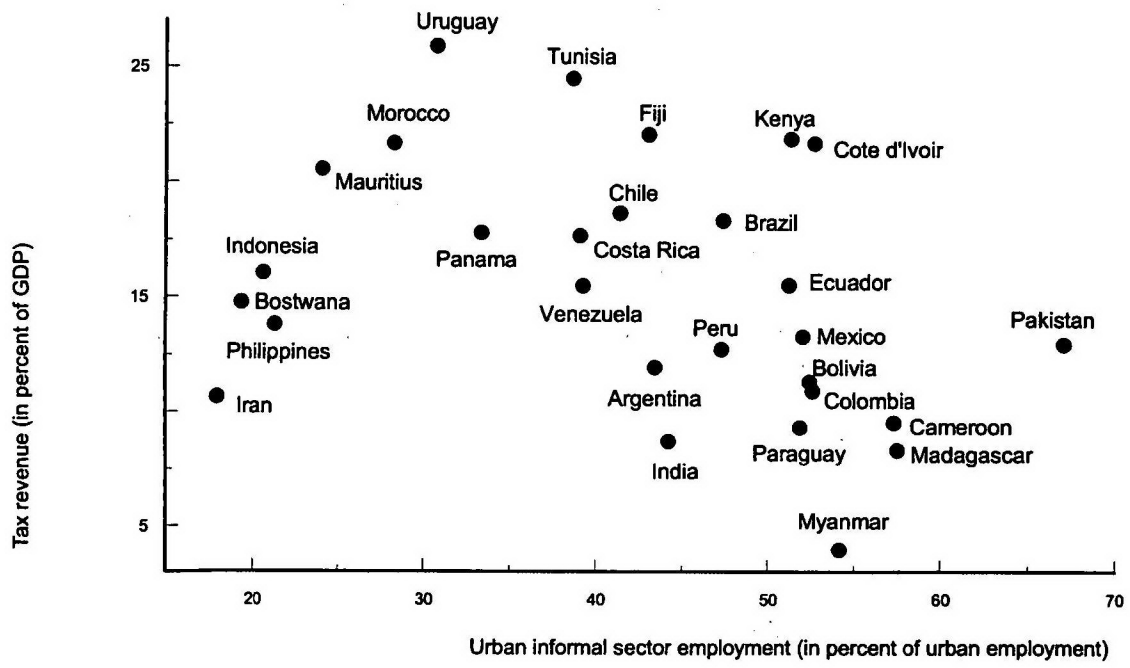
Thierfelder, Karen E., and Clinton R. Shiells, "Trade and Labor Market Behavior," in *Applied Methods for Trade Policy Analysis*, ed. by Joseph F. Francois and Kenneth A. Reinert, Cambridge University Press (Cambridge: 1997).

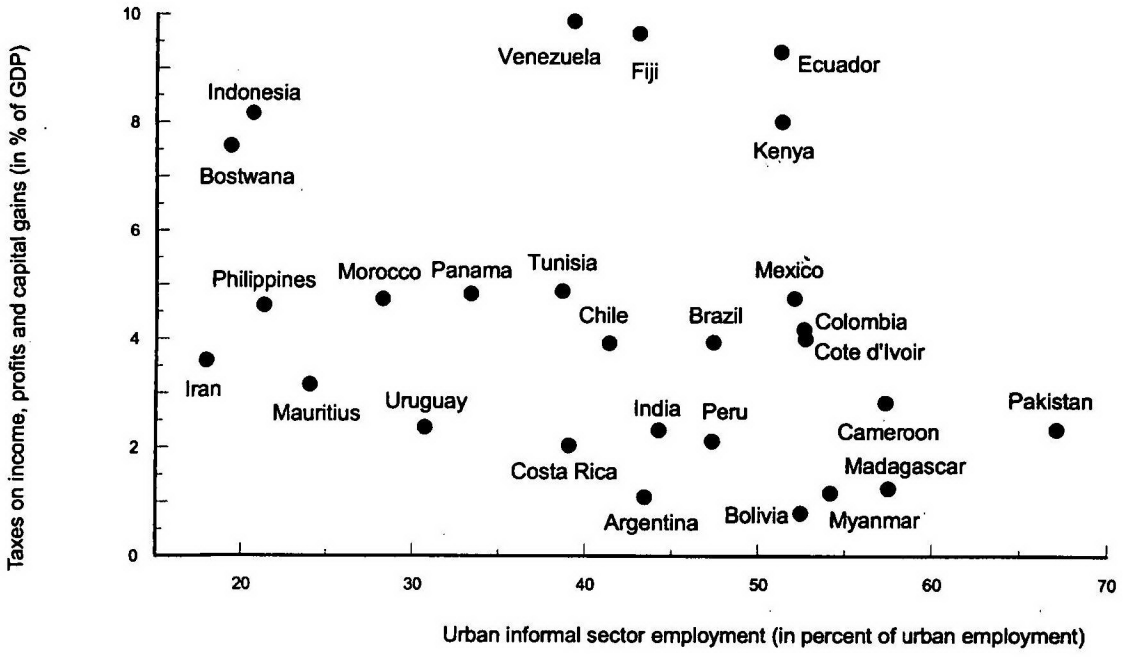
Velenchik, Anne, "Cash Seeking Behavior and Migration: A Place-to-Place Migration Function for Côte d'Ivoire," *Journal of African Economies*, 2 (December 1994), 329-47.

Wang, Eric C., "Public Infrastructure and Economic Growth: a New Approach Applied to East Asian Economies," *Journal of Policy Modelling*, 24 (August 2002), 411-35.

Webber, Don J., "Policies to Stimulate Growth: Should we Invest in Health or Education?," *Applied Economics*, 34 (September 2002), 1633-43.

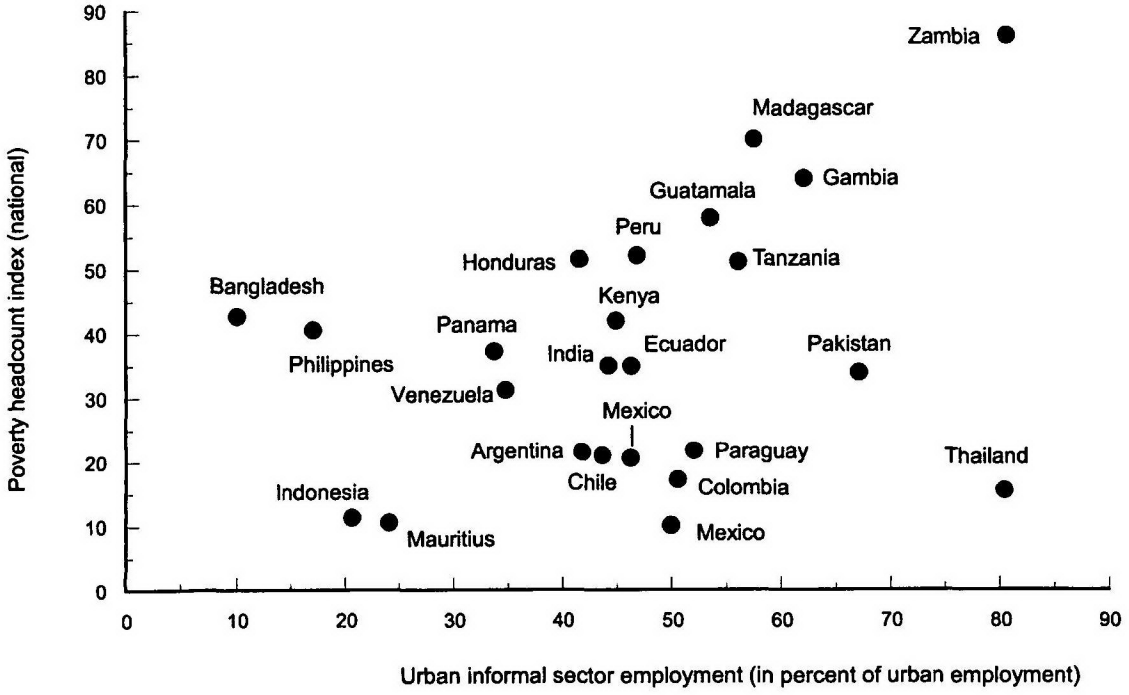
Figure 1
Developing Countries: Informal Sector Size and Tax Revenue
(averages for various years)





Source: World Bank and International Labor Organization.

Figure 2
Developing Countries: Informal Sector Size and Poverty
(averages, in percent)



Source: World Bank and International Labor Organization.

Figure 3
Production Structure and the Labor Market in Mini-IMMPA

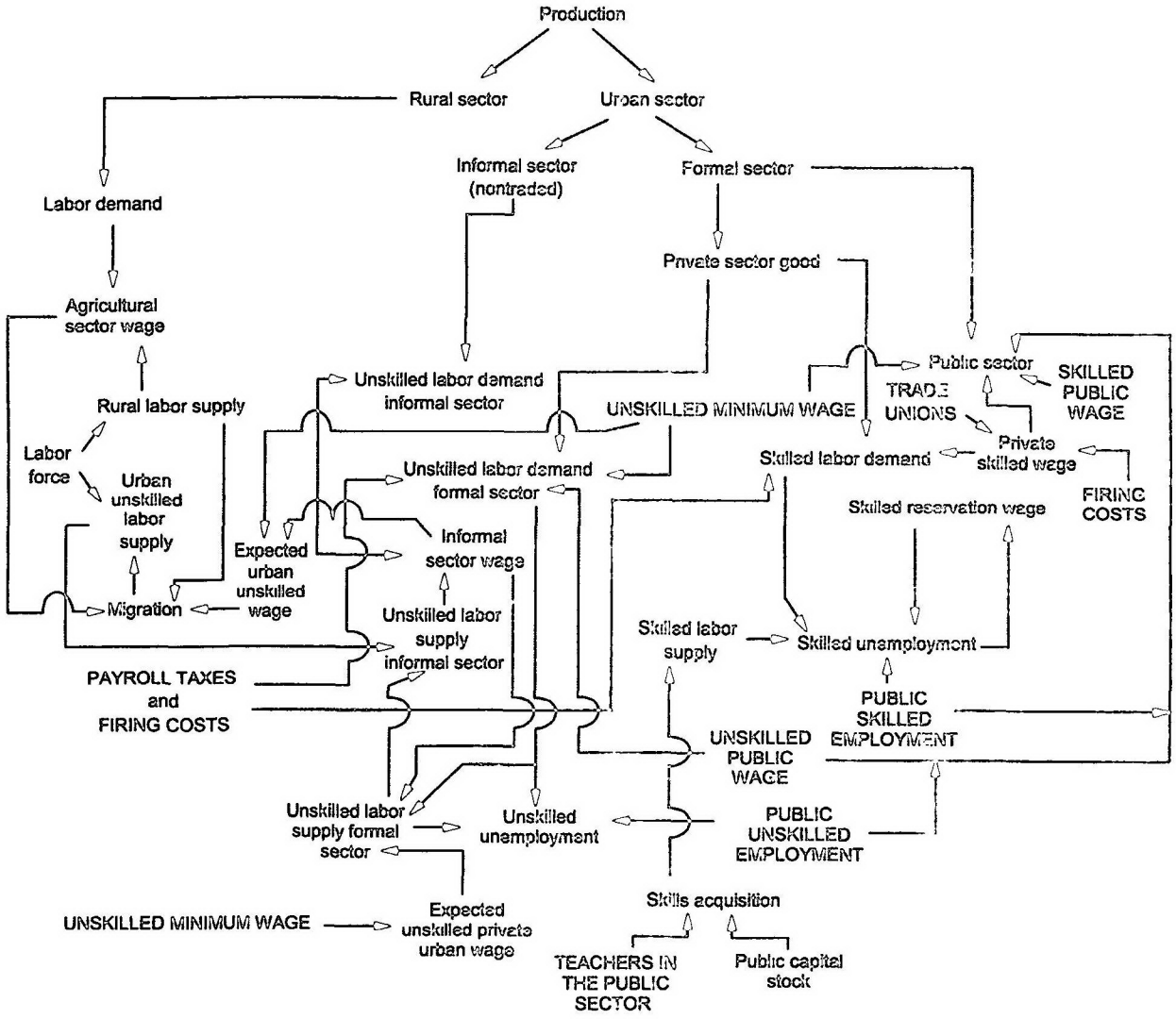


Figure 4. Mini-IMMPA: Analytical Structure

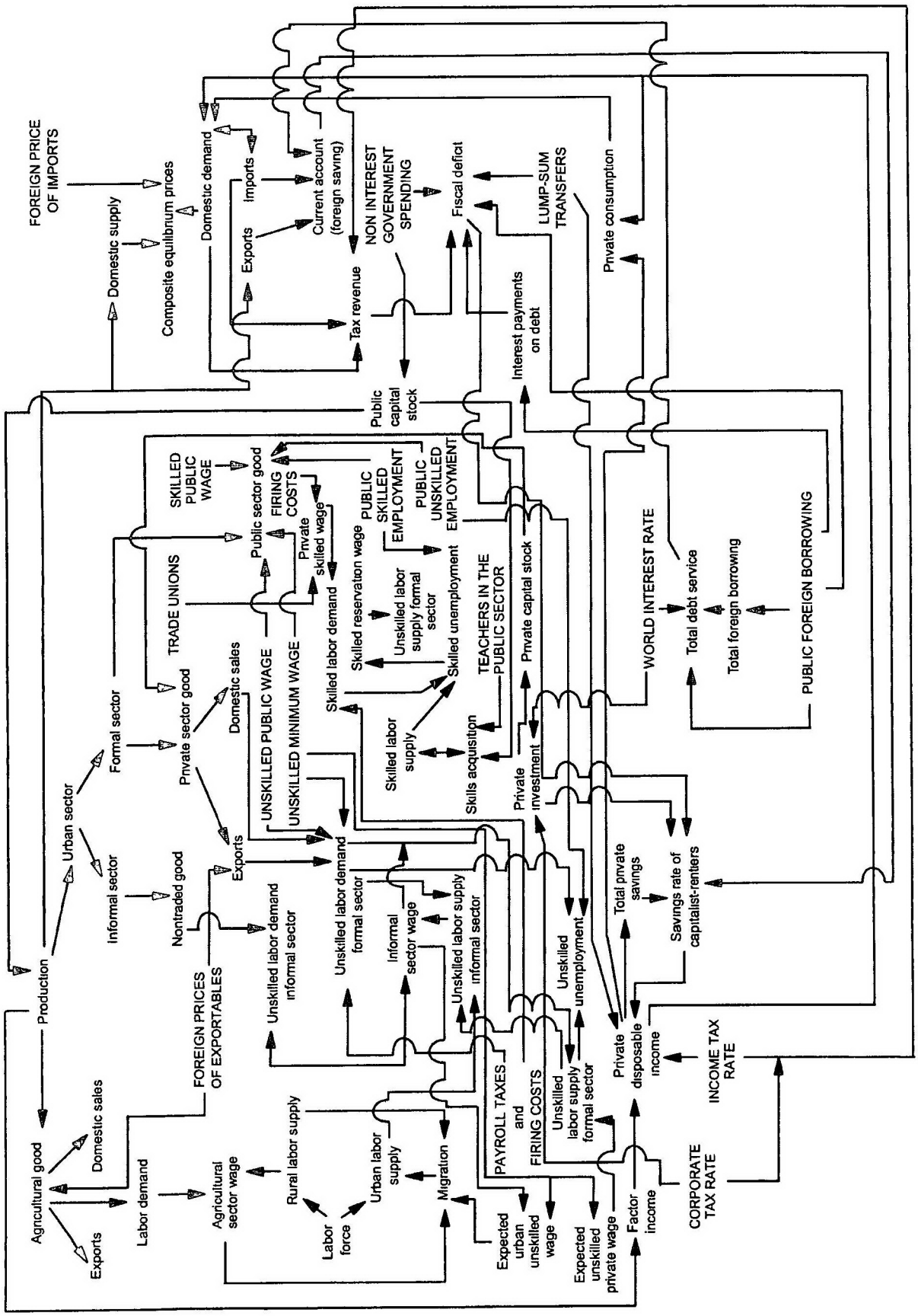
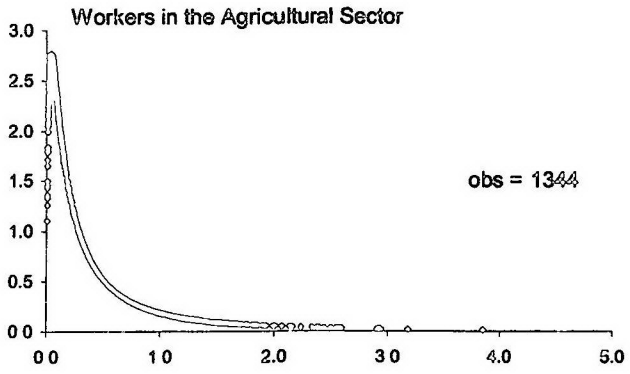
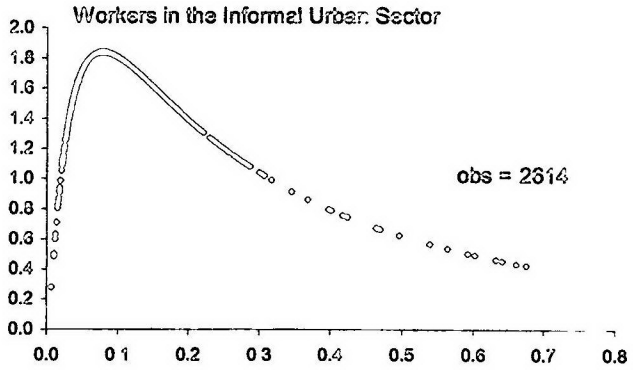


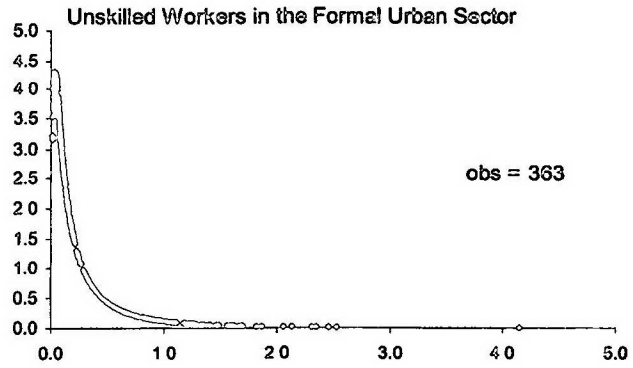
Figure 5

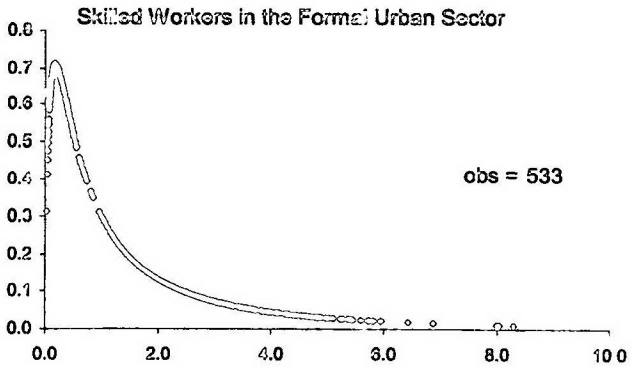
Mini-IMMPA: Initial Distribution of Income, Based on Log-Normal Approximation

(obs denotes the number of households in each group)









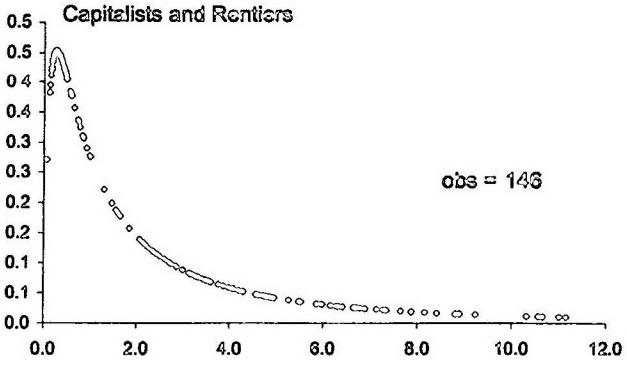


Table 1
Mini-IMMPA: Simulation Results
5 Percent Cut in Unskilled Labor Minimum Wage
(Percentage deviations from baseline, unless otherwise indicated)

	Periods									
	1	2	3	4	5	6	7	8	9	10
Real Sector										
Total resources	0.2	0 0	0 3	0 4	0.2	0 1	0.2	0 2	0.2	0 1
Gross domestic product	0 3	0 3	0.5	0 5	0 3	0 3	0 3	0 4	0 3	0 3
Imports of goods and NFS	-0 7	-1 3	-0.5	0 0	-0 5	-0 9	-0 7	-0 5	-0 6	-0 8
Total expenditure	0 2	0 0	0 3	0.4	0 2	0 1	0.2	0.2	0.2	0 1
Total consumption	0 0	0 7	0 5	0 0	-0 1	0.2	0.2	0 0	-0 1	0 0
Private consumption	0 0	0 8	0 6	0 0	-0 1	0.2	0.3	0 0	-0 1	0 0
Public consumption	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Total investment	-0 9	-4 1	-1 6	0.9	-0 1	-1 9	-1 8	-0 5	-0 5	-1.2
Private investment	-1 0	-5 5	-2 1	1.5	0.1	-2.4	-2 1	-0 5	-0.4	-1 4
Public investment	-0 7	-0 9	-0 6	-0 4	-0 6	-0 7	-0 7	-0 6	-0 6	-0 7
Exports of goods and NFS	1 7	1 8	1 5	1 4	1 6	1.7	1 7	1 6	1 7	1 8
External Sector (% of GDP)[1]										
Current account	0 5	0 6	0 4	0 4	0 5	0 6	0 6	0 6	0 6	0 7
Exports of goods and NFS	0 3	0 3	0.2	0.2	0 3	0 3	0 3	0 3	0 3	0 3
Imports of goods and NFS	-0.2	-0 3	-0.2	-0 1	-0.1	-0.2	-0.2	-0 1	-0.2	-0.2
Factor services	0 0	0 0	-0 1	-0 1	-0 1	-0 1	-0 1	-0 1	-0.2	-0 2
Capital account	-0 5	-0 6	-0.4	-0 4	-0 5	-0.6	-0 6	-0 6	-0 6	-0 7
Private borrowing	-0.5	-0 6	-0.4	-0 4	-0 5	-0 6	-0 6	-0 6	-0 6	-0 7
Public borrowing	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Government Sector (% of GDP)[1]										
Total revenue	-0.2	-0 3	-0.2	-0 1	-0.2	-0.2	-0.2	-0 2	-0.2	-0 2
Direct taxes	-0 1	-0 1	0 0	0 0	0.0	-0 1	0 0	0 0	0 0	0 0
Indirect taxes	-0.2	-0 3	-0.2	-0 1	-0.1	-0.2	-0.2	-0 1	-0 1	-0 2
Total expenditure	-0 1	-0 1	-0.2	-0 2	-0 1	-0 1	-0 1	-0.1	-0 1	-0 1
Consumption	0 0	0 0	0 0	-0 1	0 0	0 0	0 0	0 0	0 0	0 0
Investment	-0 1	-0 1	-0 1	-0 1	-0 1	-0 1	-0 1	-0 1	-0 1	-0 1
Transfers to households	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Foreign interest payments	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Total financing	0 1	0.2	0 0	-0 1	0 0	0 1	0 1	0 0	0 1	0 1
Foreign financing	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Domestic borrowing	0.1	0.2	0 0	-0 1	0 0	0 1	0 1	0 0	0 1	0 1
Labor Market										
Nominal wages										
Agricultural sector	1 8	2 0	1 4	0.3	-0.3	-0 4	-0 6	-1.2	-1 6	-1 8
Informal sector	2 0	2 6	1 6	1 3	2 2	2 7	2 5	2 3	2 6	2 9
Private formal sector										
Unskilled	-5 0	-5 0	-5 0	-5 0	-5 0	-5 0	-5 0	-5 0	-5 0	-5 0
Skilled	-1 6	-2 4	-1 4	-0 7	-1.2	-1 7	-1 5	-1.2	-1.2	-1 4
Public sector										
Unskilled	0 0	0 0	0 0	0 0	0.0	0 0	0 0	0 0	0 0	0 0
Skilled	0 1	0 1	0 1	0 0	0.1	0 1	0 1	0 1	0 1	0 1
Employment										
Agricultural sector	0 0	0.2	0 4	0 5	0 7	0.8	0 9	1 1	1.2	1 3
Informal sector	0 0	0.2	0 4	0.2	-0 1	-0 1	0 0	0.0	-0.2	-0 2
Private formal sector										
Unskilled	4 3	3.2	4 7	5 8	5 0	4.2	4 5	5 1	5 0	4 7
Skilled	-0 1	-0 2	-0 1	-0 1	-0 1	-0.2	-0 1	-0 1	-0 1	-0 1
Public sector										
Unskilled	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Skilled	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0.0	0 0	0 0
Labor supply (urban formal sector)										
Unskilled	0 0	-1.2	-2 3	-1 9	-1.2	-1 5	-2.2	-2 3	-2 0	-2 1
Skilled	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Unemployment rate (urban formal sector) [1]										
Unskilled	-2 8	-3 3	-5.4	-5 7	-4.5	-4 3	-5.2	-5 6	-5 4	-5 2
Skilled	0 1	0 1	0 1	0 0	0.1	0 1	0 1	0.1	0 1	0 1
Real wage differentials [1]										
Expected urban-rural (% of rural wage)	0 0	-8 7	-8 9	-8 8	-7 6	-8 5	-8.3	-8 2	-5 6	-5 0
Expected formal-informal (% of informal wage)	0 0	-3 1	-3.2	1.2	1 9	-0 8	-1 7	-0.3	0 6	-0 1
Migration [1]										
Rural-urban (% of urban labor supply)	0 00	-0 08	-0 09	-0 08	-0 07	-0 06	-0 06	-0 05	-0 05	-0 04
Formal-informal (% of formal urban labor supply)	0 00	-1 16	-1.20	0 44	0 71	-0 32	-0 65	-0 10	0.23	-0 02
Memorandum Items [2]										
GDP at market prices	0 3	0.2	0 4	0.5	0 3	0.3	0.3	0 4	0 4	0 3
Value added at factor cost	0 3	0 3	0 4	0.5	0 4	0 3	0 4	0 4	0 4	0 4
Value added in rural sector	0 0	0.1	0 3	0 4	0.5	0 7	0.8	0 9	0 9	1 0
Value added in urban informal sector	0 0	0.2	0 3	0.2	-0 1	-0 1	0 0	0 0	-0 1	-0.2
Value added in urban formal sector	0 8	0 6	0 8	0 9	0 8	0 7	0 7	0 8	0 8	0 7
Private Consumption	-0 4	0.3	0 3	-0.2	-0 4	-0 1	0 0	-0.2	-0 3	-0 3
Private Investment	-0 3	-4 6	-1 8	1 9	0 6	-1 7	-1 4	0 1	0.2	-0 7
Disposable Income	0 3	0.4	0 5	0 5	0 4	0 5	0.5	0 6	0 6	0 6
Capitalists and rentiers savings rate [1]	5 8	0 8	1 9	5 9	6 6	4 7	4.3	5 8	6 6	6 2

[1] Absolute deviation from base line [2] real terms

Table 2

Mini-[illegible]PA: Price, Poverty and Distributional Indicators

5 Percent Cut in Unskilled Labor Minimum Wage

(Absolute deviations from baseline, unless otherwise indicated)

	Periods									
	1	2	3	4	5	6	7	8	9	10
Consumer Prices and the Real Exchange Rate										
Rural CPI	0.6	0.7	0.5	0.3	0.3	0.3	0.3	0.2	0.1	0.1
Urban CPI	0.3	0.4	0.3	0.2	0.2	0.3	0.3	0.2	0.2	0.2
Unskilled	0.2	0.3	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2
Skilled	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1
Real Exchange Rate	-0.2	-0.2	-0.2	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
Value Added Prices										
Rural agriculture	1.0	2.0	1.6	0.4	-0.1	-0.2	-0.4	-0.0	-1.4	-1.6
Urban private informal	2.0	2.7	1.7	1.3	2.1	2.7	2.5	2.3	2.0	2.0
Urban private formal	-2.4	-3.1	-2.0	-1.4	-1.0	-2.4	-2.1	-1.0	-1.0	-2.0
Urban public	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1
Real Disposable Income [1]										
Rural households	1.1	1.3	1.2	0.0	0.1	0.1	0.0	-0.3	-0.5	-0.7
Urban households	0.1	0.2	0.3	0.6	0.5	0.6	0.7	0.0	0.0	0.0
Informal	1.5	2.1	1.5	1.2	1.7	2.1	2.1	1.9	2.1	2.3
Formal unskilled	-0.7	-1.3	-0.5	0.1	-0.3	-0.7	-0.0	-0.3	-0.3	-0.5
Formal skilled	-0.0	-1.2	-0.7	-0.4	-0.6	-0.9	-0.0	-0.0	-0.0	-0.7
Capitalists and rentiers	-1.0	-2.6	-1.2	-0.2	-0.7	-1.2	-0.7	-0.1	0.0	-0.1
Real Consumption [1]										
Rural households	1.1	1.3	1.2	0.0	0.1	0.1	0.0	-0.3	-0.5	-0.7
Urban households	-0.7	0.1	0.1	-0.4	-0.5	-0.1	0.0	-0.1	-0.2	-0.1
Informal	1.5	2.1	1.5	1.2	1.7	2.1	2.1	1.9	2.1	2.3
Formal unskilled	-0.7	-1.3	-0.5	0.1	-0.3	-0.7	-0.6	-0.3	-0.3	-0.5
Formal skilled	-0.0	-1.2	-0.7	-0.4	-0.0	-0.0	-0.0	-0.0	-0.0	-0.7
Capitalists and rentiers	-6.5	-3.7	-3.0	-7.0	-0.0	-7.0	-6.1	-7.1	-7.0	-7.4
Household Use [1]										
Rural households	0.0	0.2	0.4	0.5	0.7	0.0	0.9	1.1	1.2	1.3
Urban households	0.0	-0.1	-0.1	-0.2	-0.3	-0.3	-0.4	-0.4	-0.4	-0.5
Informal	0.0	0.2	0.4	0.2	-0.1	-0.1	0.0	0.0	-0.2	-0.2
Formal unskilled	0.0	-1.2	-2.3	-1.9	-1.2	-1.5	-2.2	-2.3	-2.0	-2.1
Formal skilled	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Capitalists and rentiers	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Poverty and Distributional Indicators										
Consumption-based										
Poverty Line [1]										
Rural	0.6	0.7	0.5	0.3	0.3	0.3	0.3	0.2	0.1	0.1
Urban	0.3	0.4	0.3	0.2	0.2	0.3	0.3	0.2	0.2	0.2
Poverty Headcount										
Rural households	-0.7	-0.0	-0.0	0.0	0.4	0.4	0.6	1.0	1.0	1.0
Urban households	-0.4	-0.6	-0.5	-0.5	-0.5	-0.7	-0.7	-0.7	-0.7	-0.7
Informal	-0.0	-0.0	-0.5	-0.5	-0.0	-1.0	-1.0	-0.0	-1.0	-1.1
Formal unskilled	0.1	0.1	-1.6	-1.2	-0.3	-0.1	-0.7	-1.0	-0.4	-0.4
Formal skilled	0.0	0.0	0.0	0.2	0.2	0.0	0.2	0.0	0.2	0.4
Capitalists and rentiers	0.7	0.0	0.0	0.7	0.7	0.0	0.0	0.0	0.0	0.0
Economy	-0.5	-0.6	-0.6	-0.3	-0.3	-0.4	-0.3	-0.2	-0.2	-0.2
Poverty Gap										
Rural households	-0.3	-0.3	-0.2	0.0	0.2	0.2	0.3	0.4	0.5	0.6
Urban households	-0.2	-0.3	-0.3	-0.3	-0.3	-0.4	-0.4	-0.4	-0.5	-0.5
Informal	-0.3	-0.6	-0.4	-0.3	-0.5	-0.6	-0.0	-0.0	-0.0	-0.7
Formal unskilled	0.2	0.1	-0.4	-0.5	-0.2	-0.2	-0.4	-0.5	-0.4	-0.4
Formal skilled	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1
Capitalists and rentiers	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Economy	-0.3	-0.3	-0.3	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2
Distributional Indicators [2]										
Gini Coefficient	-1.7	-0.0	-0.0	-1.4	-1.5	-1.2	-1.1	-1.2	-1.3	-1.3
Theil Index	-0.0	-0.5	-0.6	-0.0	-1.0	-0.0	-0.7	-0.0	-0.0	-0.0
Poverty and Distributional Indicators										
Income-based										
Poverty Line [1]										
Rural	0.3	0.7	0.5	0.3	0.3	0.3	0.3	0.2	0.1	0.1
Urban	0.3	0.4	0.3	0.2	0.2	0.3	0.3	0.2	0.2	0.2
Poverty Headcount										
Rural households	-0.6	-0.5	-0.4	0.0	0.4	0.4	0.5	0.0	1.1	1.0
Urban households	-0.7	-0.0	-0.0	-0.0	-0.0	-1.0	-1.0	-0.0	-1.0	-1.1
Informal	-1.2	-1.4	-0.0	-0.0	-1.3	-1.5	-1.5	-1.4	-1.5	-1.7
Formal unskilled	0.1	0.0	-0.4	-0.0	-0.1	-0.1	-0.4	-0.4	-0.3	-0.3
Formal skilled	0.2	0.0	0.0	0.2	0.0	0.0	0.2	0.4	0.0	0.2
Capitalists and rentiers	0.0	0.7	0.7	0.0	0.0	0.7	0.7	0.0	0.0	0.0
Economy	-0.7	-0.7	-0.0	-0.4	-0.5	-0.0	-0.0	-0.4	-0.4	-0.5
Poverty Gap										
Rural households	-0.3	-0.3	-0.2	0.0	0.2	0.2	0.3	0.4	0.5	0.6
Urban households	-0.2	-0.3	-0.3	-0.2	-0.3	-0.4	-0.4	-0.4	-0.4	-0.5
Informal	-0.4	-0.6	-0.3	-0.3	-0.5	-0.6	-0.0	-0.5	-0.0	-0.7
Formal unskilled	0.2	0.0	-0.4	-0.4	-0.2	-0.1	-0.3	-0.4	-0.3	-0.3
Formal skilled	0.0	0.1	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1
Capitalists and rentiers	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Economy	-0.3	-0.3	-0.3	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2
Distributional Indicators [2]										
Gini Coefficient	-0.5	-0.7	-0.4	-0.2	-0.2	-0.3	-0.3	-0.1	-0.1	-0.1
Theil Index	-0.3	-0.4	-0.3	-0.1	-0.2	-0.2	-0.2	-0.1	-0.1	-0.1

[1] Percentage deviations from the base line [2] Gini Coefficients and Theil Indices measure between-group inequality

Table 3
Mini-IMMPA: Simulation Results
5 Percent Cut in Unskilled Labor Payroll Tax Rate, Non Revenue Neutral
(Percentage deviations from baseline, unless otherwise indicated)

	Periods									
	1	2	3	4	5	6	7	8	9	10
Real Sector										
Total resources	0 1	-0 2	0 0	0 1	0 0	-0.2	-0 1	0 0	0 0	-0 1
Gross domestic product	0.2	0 0	0 1	0.2	0 1	0 0	0 1	0 1	0 1	0 0
Imports of goods and NFS	-0 8	-1 5	-1 0	-0 4	-0 7	-1 1	-1 0	-0 7	-0 7	-0 9
Total expenditure	0 1	-0 2	0 0	0 1	0 0	-0.2	-0 1	0 0	0 0	-0 1
Total consumption	0 0	0.3	0.2	-0 3	-0 4	-0.2	-0 1	-0 2	-0 3	-0 3
Private consumption	0 0	0 3	0.2	-0 3	-0.5	-0.2	-0 1	-0 2	-0.4	-0 3
Public consumption	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Total investment	-0 8	-3 7	-2 2	0 4	0 0	-1 6	-1 7	-0 7	-0 5	-1 0
Private investment	-0 9	-5 0	-2.9	0 7	0 2	-2 0	-2 1	-0 8	-0 5	-1 2
Public investment	-0 8	-0 9	-0 7	-0 4	-0 8	-0 7	-0 7	-0 6	-0 6	-0 6
Exports of goods and NFS	1 4	1 5	1 3	1 1	1 3	1.3	1 3	1 2	1.2	1 3
External Sector (% of GDP) [1]										
Current account	0 4	0 6	0 5	0 4	0 5	0 6	0.6	0 5	0 5	0 6
Exports of goods and NFS	0 3	0 3	0 3	0.2	0 3	0 3	0 3	0 3	0.3	0 3
Imports of goods and NFS	-0.2	-0 3	-0.2	-0 1	-0 1	-0.2	-0.2	-0 1	-0 1	-0 2
Factor services	0 0	0 0	0 0	-0 1	-0 1	-0 1	-0 1	-0 1	-0 1	-0 2
Capital account	-0 4	-0 6	-0 5	-0 4	-0 5	-0 6	-0 6	-0 5	-0 5	-0 6
Private borrowing	-0 4	-0 6	-0 5	-0 4	-0 5	-0 6	-0 6	-0 5	-0.5	-0 6
Public borrowing	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Government Sector (% of GDP) [1]										
Total revenue	-0 4	-0 5	-0 4	-0 3	-0 4	-0 4	-0 4	-0 4	-0 4	-0 4
Direct taxes	0 0	-0 1	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Indirect taxes	-0 4	-0 5	-0 4	-0 3	-0 3	-0 4	-0 4	-0 3	-0 3	-0 4
Total expenditure	-0 1	-0 1	-0 1	-0 1	-0 1	0 0	-0 1	-0 1	-0 1	0 0
Consumption	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Investment	-0 1	-0 1	-0 1	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Transfers to households	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Foreign interest payments	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Total financing	0 3	0 5	0 4	0 3	0 3	0 4	0 4	0 3	0 3	0 3
Foreign financing	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Domestic borrowing	0 3	0 5	0 4	0 3	0 3	0 4	0 4	0 3	0 3	0 3
Labor Market										
Nominal wages										
Agricultural sector	1 5	1 4	1 3	0 7	0 4	0 6	0.7	0 6	0 4	0 4
Informal sector	1 7	2.8	2 0	1 4	1 9	2 3	2 1	1 8	1 8	2 0
Private formal sector										
Unskilled	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Skilled	-1 4	-2.5	-1 9	-1 1	-1 4	-1 9	-1 8	-1 5	-1 5	-1 7
Public sector										
Unskilled	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Skilled	0 0	0 1	0 1	0 0	0 0	0 1	0 1	0 0	0 0	0 1
Employment										
Agricultural sector	0 0	0 0	0 1	0 1	0 1	0 1	0 1	0 1	0 1	0 1
Informal sector	0 0	-0 2	0 0	-0 2	-0 4	-0 4	-0 3	-0 2	-0 3	-0 4
Private formal sector										
Unskilled	3 4	2 0	3 0	4 0	3 6	2 8	3 0	3 5	3 5	3 2
Skilled	-0 1	-0 2	-0.2	-0 1	-0 1	-0.2	-0.2	-0.1	-0 1	-0.2
Public sector										
Unskilled	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Skilled	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Labor supply (urban formal sector)										
Unskilled	0 0	0 6	0 0	0.4	1 2	1.2	0 8	0 7	1 0	1 1
Skilled	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Unemployment rate (urban formal sector) [1]										
Unskilled	-2.2	-0 7	-2 0	-2 3	-1 3	-0 8	-1 3	-1 7	-1 4	-1 1
Skilled	0 1	0 1	0 1	0 1	0 1	0 1	0 1	0 1	0 1	0 1
Real wage differentials [1]										
Expected urban-rural (% of rural wage)	0 0	-1 7	-1 2	-1 3	-0 7	-0 2	-0.2	-0 5	-0 4	-0.2
Expected formal-informal (% of informal wage)	0 0	1 7	-1 8	1 1	2 2	0 1	-1.2	-0 2	0 8	0 3
Migration [1]										
Rural-urban (% of urban labor supply)	0 00	-0 02	-0 01	-0 01	-0 01	0 00	0 00	0 00	0 00	0 00
Formal-informal (% of formal urban labor supply)	0 00	0 65	-0 68	0.41	0 83	0 02	-0 45	-0 08	0.28	0 13
Memorandum Items [2]										
GDP at market prices	0 2	-0 1	0 1	0 2	0 1	0 0	0 0	0 1	0 1	0 0
Value added at factor cost	0 2	0 1	0 1	0.2	0 1	0 0	0 1	0 1	0 1	0 1
Value added in rural sector	0 0	0 0	0 0	0 1	0 1	0 1	0 1	0 1	0 1	0 1
Value added in urban informal sector	0 0	-0 2	0 0	-0 1	-0 3	-0 3	-0.2	-0.2	-0 3	-0 3
Value added in urban formal sector	0 6	0 3	0 4	0 6	0 5	0 4	0 4	0 5	0 5	0 4
Private Consumption	-0 3	-0 1	-0 1	-0 6	-0.8	-0 6	-0 4	-0 5	-0 6	-0 6
Private Investment	-0 3	-4 1	-2.2	1.2	0 8	-1 3	-1 5	-0 2	0 1	-0 6
Disposable income	0 5	0 4	0 5	0 5	0 5	0 5	0 5	0 5	0 5	0 5
Capitalists and rentiers savings rate [1]	7 5	5 1	5 4	8 7	9 8	8.2	7 3	8 2	8 9	8 5

[1] Absolute deviation from base line [2] real terms

Table 6

Mini-MAMPA: Price, Poverty and Distributional Indicators

5 Percent Cut in Unskilled Labor Payroll Tax Rate, Non Revenue Neutral

(Absolute deviations from baseline, unless otherwise indicated)

	Periods									
	1	2	3	4	5	6	7	8	9	10
Consumer Prices and the Real Exchange Rate										
Rural CPI	0.5	0.0	0.5	0.3	0.3	0.4	0.4	0.3	0.3	0.3
Urban CPI	0.3	0.4	0.3	0.2	0.2	0.3	0.3	0.2	0.2	0.2
Unskilled	0.2	0.3	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2
Skilled	0.0	0.1	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.1
Real Exchange Rate	-0.2	-0.2	-0.2	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
Value Added Prices										
Rural capital/land	1.5	1.4	1.3	0.7	0.4	0.0	0.7	0.0	0.4	0.4
Urban private informal	1.7	2.0	2.0	1.4	1.0	2.3	2.1	1.0	1.0	2.0
Urban private formal	-1.2	-2.1	-1.4	-0.7	-1.0	-1.5	-1.4	-1.0	-1.0	-1.2
Urban public	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Real Disposable Income [1]										
Rural households	0.0	0.7	0.0	0.4	0.1	0.2	0.4	0.3	0.2	0.2
Urban households	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.0	0.0	0.0
Informal	1.3	1.0	1.5	0.5	1.1	1.5	1.4	1.2	1.1	1.3
Formal unskilled	1.0	0.0	1.4	2.0	1.7	1.3	1.4	1.7	1.7	1.5
Formal skilled	-0.7	-1.2	-0.0	-0.0	-0.7	-0.0	-0.0	-0.7	-0.7	-0.0
Capitalists and rentiers	-1.7	-2.0	-1.7	-0.7	-0.0	-1.4	-1.1	-0.5	-0.4	-0.4
Real Consumption [1]										
Rural households	0.0	0.7	0.0	0.4	0.1	0.2	0.4	0.3	0.2	0.2
Urban households	-0.0	-0.3	-0.3	-0.0	-1.0	-0.7	-0.0	-0.7	-0.0	-0.0
Informal	1.3	1.0	1.5	0.5	1.1	1.5	1.4	1.2	1.1	1.3
Formal unskilled	1.0	0.0	1.4	2.0	1.7	1.3	1.4	1.7	1.7	1.5
Formal skilled	-0.7	-1.2	-0.0	-0.0	-0.7	-0.0	-0.0	-0.7	-0.7	-0.0
Capitalists and rentiers	-11.5	-0.4	-0.0	-12.0	-13.3	-11.5	-10.1	-10.9	-11.0	-10.5
Household Size [1]										
Rural households	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Urban households	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Informal	0.0	-0.2	0.0	-0.2	-0.4	-0.4	-0.3	-0.2	-0.3	-0.4
Formal unskilled	0.0	0.0	0.0	0.4	1.2	1.2	0.0	0.7	1.0	1.1
Formal skilled	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Capitalists and rentiers	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Poverty and Distributional Indicators										
Consumption-based										
Poverty Line [1]										
Rural	0.0	0.0	0.5	0.3	0.3	0.4	0.4	0.3	0.3	0.3
Urban	0.3	0.4	0.3	0.2	0.2	0.3	0.3	0.2	0.2	0.2
Poverty Headcount										
Rural households	-0.5	-0.4	-0.0	-0.3	0.0	-0.1	-0.2	-0.1	-0.1	0.0
Urban households	-0.3	-0.0	-0.5	-0.4	-0.4	-0.5	-0.4	-0.5	-0.4	-0.3
Informal	-0.5	-0.5	-0.7	-0.5	-0.7	-0.5	-0.7	-0.5	-0.7	-0.7
Formal unskilled	-1.2	0.0	-1.0	-0.7	-0.1	0.0	-0.1	-0.4	-0.1	0.0
Formal skilled	0.0	0.0	0.0	0.4	0.2	0.0	0.2	0.0	0.2	1.0
Capitalists and rentiers	0.7	0.7	0.7	0.7	0.7	0.7	0.0	0.0	0.0	0.0
Economy	-0.0	-0.5	-0.5	-0.3	-0.3	-0.4	-0.4	-0.4	-0.3	-0.2
Poverty Gap										
Rural households	-0.3	-0.2	-0.2	-0.1	0.0	0.0	-0.1	-0.1	0.0	0.0
Urban households	-0.3	-0.4	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
Informal	-0.4	-0.5	-0.5	-0.3	-0.4	-0.5	-0.5	-0.4	-0.4	-0.5
Formal unskilled	-0.4	0.0	-0.3	-0.4	-0.1	0.0	-0.1	-0.2	-0.2	-0.1
Formal skilled	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Capitalists and rentiers	0.2	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.1
Economy	-0.3	-0.3	-0.3	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2
Distributional Indicators [2]										
Gini Coefficient	-2.0	-1.7	-1.9	-2.1	-2.3	-2.0	-1.9	-1.9	-1.9	-1.9
Theil Index	-1.1	-1.0	-0.9	-1.2	-1.4	-1.2	-1.1	-1.2	-1.3	-1.3
Poverty and Distributional Indicators										
Income-based										
Poverty Line [1]										
Rural	0.5	0.0	0.5	0.3	0.3	0.4	0.4	0.3	0.3	0.3
Urban	0.3	0.4	0.3	0.2	0.2	0.3	0.3	0.2	0.2	0.2
Poverty Headcount										
Rural households	-0.5	-0.4	-0.4	-0.2	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
Urban households	-0.7	-0.9	-0.7	-0.0	-0.7	-0.0	-0.7	-0.0	-0.7	-0.0
Informal	-1.0	-1.0	-1.1	-0.0	-1.1	-1.3	-1.2	-1.1	-1.1	-1.2
Formal unskilled	-0.4	0.0	-0.4	-0.4	0.0	0.0	0.0	0.0	-0.1	-0.3
Formal skilled	0.2	0.0	0.2	0.2	0.0	0.0	0.2	0.4	0.0	0.4
Capitalists and rentiers	0.0	0.7	0.7	0.0	0.0	0.7	0.7	0.7	0.0	0.0
Economy	-0.0	-0.7	-0.0	-0.5	-0.5	-0.0	-0.5	-0.5	-0.5	-0.0
Poverty Gap										
Rural households	-0.3	-0.2	-0.2	-0.1	0.0	0.0	-0.1	-0.1	0.0	0.0
Urban households	-0.3	-0.4	-0.3	-0.2	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
Informal	-0.4	-0.5	-0.4	-0.3	-0.4	-0.5	-0.5	-0.4	-0.4	-0.5
Formal unskilled	-0.3	0.0	-0.2	-0.3	-0.1	0.0	-0.1	-0.2	-0.1	-0.1
Formal skilled	0.0	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1
Capitalists and rentiers	0.1	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Economy	-0.3	-0.3	-0.3	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2
Distributional Indicators [2]										
Gini Coefficient	-0.5	-0.7	-0.6	-0.3	-0.3	-0.4	-0.4	-0.3	-0.2	-0.2
Theil Index	-0.3	-0.4	-0.3	-0.2	-0.2	-0.2	-0.2	-0.2	-0.1	-0.1

[1] Percentage deviations from the base line. [2] Gini Coefficients and Theil Index measure between-group inequality

Table 5
Mini-IMMPA: Simulation Results
5 Percent Cut in Unskilled Labor Payroll Tax Rate, Sales Tax Revenue Neutral
(Percentage deviations from baseline, unless otherwise indicated)

	Periods									
	1	2	3	4	5	6	7	8	9	10
Real Sector										
Total resources	0 0	-0 3	-0.2	-0 2	-0.2	-0 2	-0.2	-0 2	-0.2	-0 2
Gross domestic product	0 2	-0 1	0 0	0 0	-0 1	-0 1	-0 1	-0 1	-0 1	-0 1
Imports of goods and NFS	-0 8	-1 5	-1 1	-1 0	-1 1	-1 2	-1 1	-1 1	-1 1	-1 1
Total expenditure	0 0	-0 3	-0.2	-0 2	-0.2	-0 2	-0.2	-0 2	-0.2	-0 2
Total consumption	-0.2	-0 3	-0 4	-0 5	-0 6	-0 5	-0 5	-0 5	-0 5	-0 5
Private consumption	-0 3	-0 4	-0 5	-0 6	-0 7	-0 6	-0 6	-0 6	-0 6	-0 6
Public consumption	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Total investment	-0 6	-2 0	-0 9	-0 4	-0 7	-0 8	-0 8	-0 7	-0 8	-0 8
Private investment	-0 8	-2 7	-1 2	-0 5	-0 9	-1 1	-1 0	-1 0	-1 0	-1 0
Public investment	-0 3	-0 3	-0 3	-0 3	-0 3	-0 3	-0 3	-0 2	-0.2	-0 2
Exports of goods and NFS	1 4	1 5	1 4	1 3	1 3	1 3	1 3	1 3	1 3	1 2
External Sector (% of GDP)[1]										
Current account	0 5	0 6	0 5	0.5	0 6	0 6	0 6	0 6	0 6	0 7
Exports of goods and NFS	0 3	0 4	0 3	0 3	0 3	0 3	0 3	0 3	0 3	0 3
Imports of goods and NFS	-0.2	-0 2	-0.2	-0.2	-0.2	-0 2	-0.2	-0 2	-0.2	-0 2
Factor services	0 0	0 0	0 0	-0 1	-0 1	-0 1	-0 1	-0 1	-0.2	-0.2
Capital account	-0 5	-0 6	-0 5	-0 5	-0 6	-0 6	-0 6	-0 6	-0 6	-0 7
Private borrowing	-0 5	-0 6	-0 5	-0 5	-0 6	-0 6	-0 6	-0 6	-0 6	-0 7
Public borrowing	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Government Sector (% of GDP)[1]										
Total revenue	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Direct taxes	-0 1	-0 1	-0 1	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Indirect taxes	0 0	0 1	0 1	0 0	0 1	0 1	0 1	0 1	0 1	0 1
Total expenditure	-0 1	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Consumption	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Investment	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Transfers to households	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Foreign interest payments	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Total financing	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Foreign financing	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Domestic borrowing	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Labor Market										
Nominal wages										
Agricultural sector	0 9	0 3	0 3	0 1	0 0	0 0	0 0	0 0	0 0	0 0
Informal sector	0 7	1 1	0 9	0 9	1 0	1 0	0 9	0 9	0 9	0 9
Private formal sector										
Unskilled	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Skilled	-1 7	-2 4	-2 0	-1 8	-2 0	-2 0	-2 0	-2 0	-2 0	-2 0
Public sector										
Unskilled	0 0	0 0	0.0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Skilled	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Employment										
Agricultural sector	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Informal sector	0 0	-0 3	-0.2	-0 3	-0 4	-0 4	-0 4	-0 4	-0 4	-0 4
Private formal sector										
Unskilled	3 1	2 1	2 7	2 9	2 7	2 7	2 8	2 8	2 8	2 8
Skilled	-0 1	-0 2	-0.2	-0 2	-0.2	-0 2	-0 2	-0 2	-0 2	-0 2
Public sector										
Unskilled	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Skilled	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Labor supply (urban formal sector)										
Unskilled	0 0	0 9	0 8	1 1	1 3	1.3	1 3	1 3	1 4	1 4
Skilled	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Unemployment rate (urban formal sector) [1]										
Unskilled	-2 0	-0 5	-1 1	-0 8	-0 6	-0 6	-0 7	-0.8	-0 6	-0 6
Skilled	0 1	0 1	0 1	0 1	0 1	0 1	0 1	0 1	0 1	0 1
Real wage differentials [1]										
Expected urban-rural (% of rural wage)	0 0	-1 1	-0.2	-0 2	0 0	0 2	0.2	0 1	0 2	0 2
Expected formal-informal (% of informal wage)	0 0	2 5	-0.3	0 8	0 6	0 0	0 0	0 1	0 1	0 1
Migration [1]										
Rural-urban (% of urban labor supply)	0 00	-0 01	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00
Formal-informal (% of formal urban labor supply)	0 00	0 91	-0 12	0.30	0 22	-0 01	-0 02	0 03	0 04	0 02
Memorandum Items [2]										
GDP at market prices	0 1	-0 1	0 0	0 0	0 0	-0 1	0 0	-0 1	-0 1	-0 1
Value added at factor cost	0 2	0 0	0 1	0 1	0 0	0 0	0 0	0 0	0 0	0 0
Value added in rural sector	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Value added in urban informal sector	0 0	-0.2	-0.2	-0 3	-0 3	-0 3	-0 3	-0 3	-0 3	-0 3
Value added in urban formal sector	0 6	0 3	0 4	0 4	0 4	0 4	0 4	0 4	0 3	0 3
Private Consumption	-0.4	-0 5	-0 6	-0 8	-0 8	-0 7	-0 7	-0 7	-0 7	-0 7
Private Investment	-0 5	-2 4	-0 9	-0 2	-0 6	-0 8	-0 7	-0 7	-0 8	-0 8
Disposable income	0 1	-0 1	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 1
Capitalists and rentiers savings rate [1]	5 0	3 8	5.2	6 3	6 1	5 9	6 0	6 1	6 1	6 1

[1] Absolute deviation from base line [2] real terms

Table 6

Mini-MAPA: Price, Poverty and Distributional Indicators

5 Percent Cut in Unskilled Labor / Payroll Tax Rate, Sales Tax Revenue Neutral

(Absolute deviations from baseline, unless otherwise indicated)

	Level	Period 1	2	3	4	5	6	7	8	9	10
Consumer Prices and the Real Exchange Rate											
Rural CPI		0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Urban CPI		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Unskilled		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Skilled		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Real Exchange Rate		0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Value Added Prices											
Rural agriculture		0.9	0.3	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Urban private informal		0.7	1.1	0.9	0.8	0.8	0.9	0.9	0.9	0.9	0.8
Urban private formal		-1.4	-2.0	-1.6	-1.4	-1.3	-1.6	-1.5	-1.5	-1.5	-1.5
Urban public		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Real Disposable Income [1]											
Rural households		0.8	0.1	0.1	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
Urban households		0.0	-0.2	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1
Informal		0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Formal unskilled		1.5	1.0	1.4	1.5	1.4	1.4	1.4	1.4	1.4	1.4
Formal skilled		-0.8	-1.1	-0.9	-0.9	-0.9	-1.0	-0.9	-0.9	-0.9	-0.9
Capitalists and rentiers		-2.0	-2.7	-1.9	-1.9	-1.9	-1.4	-1.2	-1.0	-0.9	-0.8
Real Consumption [1]											
Rural households		0.0	0.1	0.1	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
Urban households		-0.7	-0.7	-0.8	-0.9	-0.9	-0.9	-0.9	-0.9	-0.9	-0.9
Informal		0.5	0.6	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Formal unskilled		1.5	1.0	1.4	1.5	1.4	1.4	1.4	1.4	1.4	1.4
Formal skilled		-0.8	-1.1	-0.9	-0.9	-0.9	-1.0	-0.8	-0.9	-0.9	-0.9
Capitalists and rentiers		-3.6	-7.6	-2.7	-2.7	-2.2	-2.7	-2.5	-2.1	-1.9	-1.7
Household Size [1]											
Rural households		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Urban households		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Informal		0.0	-0.3	-0.2	-0.3	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4
Formal unskilled		0.0	0.9	0.0	1.1	1.3	1.3	1.3	1.3	1.3	1.4
Formal skilled		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Capitalists and rentiers		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Poverty and Distributional Indicators											
Consumption-based											
Poverty Line [1]											
Rural		0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Urban		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Poverty Headcount											
Rural households	40.0	-0.3	-0.1	-0.1	0.0	0.1	0.1	0.1	0.1	0.0	0.1
Urban households	33.0	-0.4	-0.3	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	0.0
Informal	40.4	-0.3	-0.1	-0.3	-0.4	-0.4	-0.4	-0.3	-0.3	-0.3	-0.2
Formal unskilled	36.0	-1.2	0.0	0.4	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
Formal skilled	10.7	0.0	0.0	0.0	0.4	0.2	0.0	0.2	0.2	0.2	1.0
Capitalists and rentiers	1.3	0.7	0.7	0.7	0.7	0.7	0.0	0.0	0.0	0.0	0.0
Economy	41.1	-0.3	-0.2	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	0.0
Poverty Gap											
Rural households	20.0	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Urban households	15.2	-0.2	-0.2	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
Informal	19.0	-0.2	-0.3	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2
Formal unskilled	14.0	-0.3	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
Formal skilled	2.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Capitalists and rentiers	0.4	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Economy	10.0	-0.2	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
Distributional Indicators [2]											
Gini Coefficient	21.0	-1.4	-1.2	-1.4	-1.0	-1.5	-1.4	-1.4	-1.3	-1.3	-1.3
Theil Index	6.7	-0.8	-0.7	-0.8	-0.8	-0.9	-0.9	-0.9	-0.9	-0.9	-0.9
Poverty and Distributional Indicators											
Income-based											
Poverty Line [1]											
Rural		0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Urban		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Poverty Headcount											
Rural households	43.8	-0.4	0.0	-0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1
Urban households	34.5	-0.4	-0.3	-0.4	-0.4	-0.4	-0.4	-0.4	-0.3	-0.3	-0.2
Informal	43.3	-0.9	-0.7	-0.6	-0.7	-0.7	-0.6	-0.7	-0.7	-0.4	-0.4
Formal unskilled	32.5	-0.4	0.0	-0.3	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
Formal skilled	9.0	0.2	0.0	0.0	0.2	0.0	0.0	0.2	0.1	0.0	0.4
Capitalists and rentiers	4.0	0.0	0.7	0.7	0.0	0.0	0.7	0.7	0	0.7	0.0
Economy	38.5	-0.4	-0.2	-0.3	-0.3	-0.3	-0.2	-0.2	-0.2	-0.2	-0.1
Poverty Gap											
Rural households	19.8	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Urban households	13.7	-0.1	-0.2	-0.1	-0.1	-0.1	0.1	-0.1	-0.1	0.1	-0.1
Informal	17.4	-0.2	-0.3	-0.2	-0.2	-0.2	-0.2	-0.2	-2	0.2	0.2
Formal unskilled	13.1	-0.3	0.0	-0.1	-0.1	0.0	0.0	0.0	0	0.0	0.0
Formal skilled	1.8	0.0	0.1	0.1	0.1	0.1	0.1	0.1	1	0.1	0.1
Capitalists and rentiers	0.4	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
Economy	15.4	-0.2	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
Distributional Indicators [2]											
Gini Coefficient	23.6	-0.4	-0.5	-0.4	-0.3	-0.3	-0.3	-0.2	-0.2	-0.2	-0.2
Theil Index	7.1	-0.3	-0.3	-0.2	-0.2	-0.2	-0.2	-0.2	-0.1	-0.1	-0.1

[1] Percentage deviations from the base run [2] Gini Coefficients and Theil Indices measure both between-group inequality

Table 7
Mini-IMMPA: Simulation Results
5 Percent Cut in Unskilled Labor Payroll Tax Rate, Income Tax Revenue Neutral
(Percentage deviations from baseline, unless otherwise indicated)

	Periods									
	1	2	3	4	5	6	7	8	9	10
Real Sector										
Total resources	0 1	-0 2	0 0	0 1	0 0	-0 1	-0 1	0 0	0 0	-0 1
Gross domestic product	0 3	0 0	0 1	0 2	0 1	0 0	0 1	0 1	0 1	0 0
Imports of goods and NFS	-0 6	-1 4	-0 9	-0 4	-0 7	-1 0	-0 9	-0 7	-0 7	-0 8
Total expenditure	0 1	-0 2	0 0	0 1	0 0	-0 1	-0 1	0 0	0 0	-0 1
Total consumption	0 0	0 3	0 2	-0 3	-0 4	-0 2	-0 1	-0 2	-0 3	-0 2
Private consumption	0 0	0 3	0 2	-0 3	-0 5	-0 2	-0 1	-0 2	-0 3	-0 3
Public consumption	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Total investment	-0 8	-3 6	-2 1	0 3	-0 1	-1 5	-1 6	-0 7	-0 5	-1 0
Private investment	-0 9	-4 8	-2 7	0 6	0 1	-1 9	-2 0	-0 8	-0 5	-1 2
Public investment	-0 6	-0 9	-0 6	-0 4	-0 5	-0 7	-0 6	-0 5	-0 5	-0 6
Exports of goods and NFS	1 4	1 5	1 3	1 2	1 3	1 3	1 3	1 2	1.2	1 3
External Sector (% of GDP)[1]										
Current account	0 4	0 6	0 5	0 4	0 5	0 6	0 6	0 5	0 5	0 6
Exports of goods and NFS	0 3	0 3	0 3	0 2	0 3	0 3	0 3	0 3	0 3	0 3
Imports of goods and NFS	-0 1	-0 3	-0.2	-0 1	-0 1	-0 2	-0.2	-0 1	-0 1	-0 2
Factor services	0 0	0 0	0 0	-0 1	-0 1	-0 1	-0 1	-0 1	-0 1	-0 2
Capital account	-0 4	-0 6	-0 5	-0 4	-0 5	-0 6	-0 6	-0 5	-0 5	-0 6
Private borrowing	-0 4	-0 6	-0 5	-0 4	-0 5	-0 6	-0 6	-0 5	-0 5	-0 6
Public borrowing	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Government Sector (% of GDP)[1]										
Total revenue	-0 1	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Direct taxes	0 3	0 4	0 3	0 3	0 3	0 4	0 4	0 3	0 3	0 3
Indirect taxes	-0 4	-0 5	-0 4	-0 3	-0 3	-0 4	-0 4	-0 3	-0 3	-0 3
Total expenditure	-0 1	-0 1	-0 1	-0 1	-0 1	0 0	-0 1	-0 1	-0 1	0 0
Consumption	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Investment	-0 1	-0 1	-0 1	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Transfers to households	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Foreign interest payments	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Total financing	0 0	-0 1	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Foreign financing	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Domestic borrowing	0 0	-0 1	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Labor Market										
Nominal wages										
Agricultural sector	1 4	1 2	1 1	0 6	0 3	0 4	0 6	0 5	0 3	0 3
Informal sector	1 7	2 7	2 0	1 4	1 9	2 3	2 1	1 8	1 8	2 0
Private formal sector										
Unskilled	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Skilled	-1 4	-2 3	-1 8	-1 1	-1 4	-1 8	-1 7	-1 5	-1 5	-1 6
Public sector										
Unskilled	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Skilled	0 0	0 1	0 1	0 0	0 0	0 1	0 1	0 0	0 0	0 0
Employment										
Agricultural sector	0 0	0 0	0 0	0 1	0 1	0 1	0 1	0 1	0 1	0 1
Informal sector	0 0	-0 2	-0 1	-0 2	-0 4	-0 4	-0 3	-0 3	-0 3	-0 4
Private formal sector										
Unskilled	3 5	2.2	3 1	4 1	3 6	3 0	3 1	3 5	3 6	3 3
Skilled	-0 1	-0 2	-0 2	-0 1	-0 1	-0 2	-0.2	-0 1	-0 1	-0 2
Public sector										
Unskilled	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Skilled	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Labor supply (urban formal sector)										
Unskilled	0 0	0 7	0 1	0 5	1 3	1 3	0 9	0 8	1 1	1 2
Skilled	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Unemployment rate (urban formal sector)[1]										
Unskilled	-2 3	-0 8	-2 0	-2 2	-1 3	-0 8	-1 3	-1 6	-1 4	-1 1
Skilled	0 1	0 1	0 1	0 1	0 1	0 1	0 1	0 1	0 1	0 1
Real wage differentials[1]										
Expected urban-rural (% of rural wage)	0 0	-1 5	-0 9	-1 1	-0 6	-0 1	-0 1	-0 3	-0 3	-0 1
Expected formal-informal (% of informal wage)	0 0	1 9	-1 6	1 1	2 1	0 1	-1 1	-0 2	0 7	0 3
Migration[1]										
Rural-urban (% of urban labor supply)	0 00	-0 01	-0 01	-0 01	-0 01	0 00	0 00	0 00	0 00	0 00
Formal-informal (% of formal urban labor supply)	0 00	0 71	-0 61	0 39	0 77	0 02	-0 39	-0 06	0 24	0 11
Memorandum Items[2]										
GDP at market prices	0 2	0 0	0 1	0 2	0 1	0 0	0 0	0 1	0 1	0 0
Value added at factor cost	0 2	0 1	0 1	0 2	0 1	0 1	0 1	0 1	0 1	0 1
Value added in rural sector	0 0	0 0	0 0	0 1	0 1	0 1	0 1	0 1	0 1	0 1
Value added in urban informal sector	0 0	-0 2	0 0	-0 1	-0 3	-0 3	-0 2	-0 2	-0 3	-0 3
Value added in urban formal sector	0 7	0 4	0 4	0 6	0 5	0 4	0 4	0 5	0 5	0 5
Private Consumption	-0 3	-0 1	-0 1	-0 6	-0 7	-0 5	-0 4	-0 5	-0 6	-0 6
Private Investment	-0 3	-4 0	-2 1	1 1	0 7	-1 2	-1 3	-0 3	0 0	-0 6
Disposable income	0 1	-0 2	0 0	0 1	0 0	-0 1	0 0	0 1	0 1	0 0
Capitalists and rentiers savings rate[1]	3 9	-0 5	1 3	5 8	6 1	3 8	3 3	4 7	5 3	4 7

[1] Absolute deviation from base line [2] real terms

Table 8

Mini-MAMPA: Price, Poverty and Distributional Indicators

5 Percent Cut in Unskilled Labor Payroll Tax Rate, Income Tax Revenue Neutral

(Absolute deviations from baseline, unless otherwise indicated)

		Periods									
	Level	1	2	3	4	5	6	7	8	9	10
Consumer Prices and the Real Exchange Rate											
Rural CPI		0.5	0.6	0.4	0.3	0.3	0.4	0.4	0.3	0.3	0.3
Urban CPI		0.2	0.3	0.3	0.2	0.2	0.3	0.2	0.2	0.2	0.2
Unskilled		0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2
Skilled		0.0	0.1	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0
Real Exchange Rate		-0.1	-0.2	-0.2	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
Value Added Prices											
Rural agriculture		1.4	1.2	1.1	0.8	0.3	0.5	0.6	0.5	0.4	0.4
Urban private informal		1.7	2.7	1.9	1.4	1.9	2.2	2.0	1.7	1.8	1.9
Urban private formal		-1.1	-2.0	-1.3	-0.7	-0.0	-1.4	-1.3	-1.0	-1.0	-1.1
Urban public		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Real Disposable Income [1]											
Rural households		0.4	0.0	0.2	0.0	-0.3	-0.4	-0.2	-0.2	-0.3	-0.3
Urban households		0.0	-0.3	-0.1	0.2	0.1	0.0	0.0	0.1	0.2	0.1
Informal		1.2	1.9	1.4	0.9	1.1	1.4	1.4	1.2	1.1	1.2
Formal unskilled		1.4	0.5	1.2	1.0	1.5	1.1	1.2	1.5	1.5	1.4
Formal skilled		-1.7	-2.7	-2.1	-1.4	-1.7	-2.1	-2.0	-1.8	-1.7	-1.9
Capitalists and rentiers		-2.0	-4.7	-3.2	-1.0	-2.2	-2.9	-2.6	-1.9	-1.7	-1.9
Real Consumption [1]											
Rural households		0.4	0.0	0.2	0.0	-0.3	-0.4	-0.2	-0.2	-0.3	-0.3
Urban households		-0.5	-0.1	-0.2	-0.7	-0.0	-0.5	-0.4	-0.0	-0.0	-0.6
Informal		1.2	1.9	1.4	0.9	1.1	1.4	1.4	1.2	1.1	1.2
Formal unskilled		1.4	0.5	1.2	1.8	1.5	1.1	1.2	1.5	1.5	1.4
Formal skilled		-1.7	-2.7	-2.1	-1.4	-1.7	-2.1	-2.0	-1.8	-1.7	-1.9
Capitalists and rentiers		-8.0	-4.1	-4.0	-9.2	-9.9	-7.8	-8.6	-7.5	-0.0	-7.3
Household Size [1]											
Rural households		0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Urban households		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Informal		0.0	-0.2	-0.1	-0.2	-0.4	-0.4	-0.3	-0.3	-0.3	-0.4
Formal unskilled		0.0	0.7	0.1	0.5	1.3	1.3	0.9	0.8	1.1	1.2
Formal skilled		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Capitalists and rentiers		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Poverty and Distributional Indicators											
Consumption-based											
Poverty Line [1]											
Rural		0.6	0.6	0.4	0.3	0.3	0.4	0.4	0.3	0.3	0.3
Urban		0.2	0.3	0.3	0.2	0.2	0.3	0.2	0.2	0.2	0.2
Poverty Headcount											
Rural households	49.0	-0.2	0.0	-0.1	0.0	0.2	0.2	0.1	0.1	0.1	0.2
Urban households	39.0	-0.5	-0.4	-0.4	-0.3	-0.4	-0.4	-0.4	-0.3	-0.4	-0.3
Informal	48.4	-0.6	-0.9	-0.7	-0.5	-0.7	-0.0	-0.7	-0.0	-0.7	-0.7
Formal unskilled	33.0	-1.0	0.1	-0.7	-0.6	-0.1	0.1	-0.1	-0.3	0.0	0.0
Formal skilled	10.7	0.4	1.0	0.0	0.6	0.2	0.2	0.2	0.0	0.4	1.2
Capitalists and rentiers	1.3	0.7	0.7	0.7	0.7	0.7	0.0	0.0	0.0	0.0	0.0
Economy	41.1	-0.4	-0.3	-0.3	-0.2	-0.2	-0.3	-0.3	-0.2	-0.2	-0.1
Poverty Gap											
Rural households	20.0	-0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1
Urban households	15.2	-0.3	-0.4	-0.3	-0.2	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
Informal	19.3	-0.4	-0.3	-0.5	-0.3	-0.4	-0.5	-0.5	-0.4	-0.4	-0.5
Formal unskilled	14.0	-0.3	0.1	-0.2	-0.3	-0.1	0.1	-0.1	-0.1	-0.1	0.0
Formal skilled	2.9	0.1	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2
Capitalists and rentiers	0.4	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Economy	16.0	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2
Distributional Indicators [2]											
Gini Coefficient	21.0	-1.4	-0.8	-1.0	-1.0	-1.7	-1.3	-1.2	-1.3	-1.4	-1.3
Theil Index	6.7	-0.8	-0.5	-0.5	-0.8	-1.0	-0.0	-0.7	-0.0	-0.0	-0.0
Poverty and Distributional Indicators											
Income-based											
Poverty Line [1]											
Rural		0.5	0.6	0.4	0.3	0.3	0.4	0.4	0.3	0.3	0.3
Urban		0.2	0.3	0.3	0.2	0.2	0.3	0.2	0.2	0.2	0.2
Poverty Headcount											
Rural households	48.8	-0.3	0.1	-0.1	0.1	0.3	0.3	0.2	0.1	0.2	0.2
Urban households	34.5	-0.8	-0.9	-0.8	-0.6	-0.8	-0.7	-0.6	-0.5	-0.7	-0.6
Informal	43.3	-1.0	-1.6	-1.1	-0.8	-1.1	-1.3	-1.2	-1.1	-1.1	-1.2
Formal unskilled	32.5	-0.4	0.0	-0.3	-0.4	0.0	0.0	0.0	0.0	-0.1	-0.1
Formal skilled	6.0	0.8	0.8	0.4	0.2	0.6	0.0	1.0	1.0	0.0	1.0
Capitalists and rentiers	4.0	0.0	0.7	0.7	0.0	0.0	0.7	0.7	0.7	0.7	0.7
Economy	38.5	-0.5	-0.6	-0.5	-0.4	-0.3	-0.4	-0.4	-0.3	-0.4	-0.4
Poverty Gap											
Rural households	19.0	-0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1
Urban households	13.7	-0.3	-0.3	-0.3	-0.2	-0.3	-0.3	-0.3	-0.3	-0.2	-0.3
Informal	17.4	-0.4	-0.6	-0.4	-0.3	-0.4	-0.5	-0.5	-0.4	-0.4	-0.5
Formal unskilled	13.1	-0.3	0.0	-0.2	-0.2	0.0	0.0	0.0	-0.1	-0.1	0.0
Formal skilled	1.6	0.1	0.2	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2
Capitalists and rentiers	0.4	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Economy	15.4	-0.2	-0.2	-0.2	-0.2	-0.1	-0.2	-0.2	-0.2	-0.1	-0.2
Distributional Indicators [2]											
Gini Coefficient	23.5	-0.6	-0.5	-0.7	-0.4	-0.5	-0.6	-0.5	-0.4	-0.4	-0.4
Theil Index	7.1	-0.4	-0.6	-0.4	-0.3	-0.3	-0.4	-0.3	-0.3	-0.2	-0.3

[1] Percentage deviations from the base line [2] Gini Coefficients and Theil Indices measure between-group inequality

Table B1[1]
Mini-IMMPA variables in SAM framework

		Accounts																										
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Rural Agricultural Sector	1	PC * (a_{1j} * X)								PC * C					PC * G									PK * Z_G			PK * Z_P	ER * wpe * E
Urban Informal Sector	2																											
Urban Formal Sector	3																											
Urban Public Sector	4																											
Urban Unskilled Labor	5	W * U																										
Urban Skilled Labor	6	W * S																										
Profits	7	PR																										
Enterprises	8							PR_3																				
Rural Agricultural Households	9							PR_1																				
Urban Informal Households	10							PR_2																				
Urban Formal Unskilled Households	11					W * U	W * S								gamma * TR													
Urban Formal Skilled Households	12																											
Capitalist Households	13								(1 - chi) * NPR_3																			
Current Government	14																		TXR									ER * (FL_G - $FL_{G\,1}$)
Payroll Taxes	15	ptx * W * U																										
Employment Subsidies	16	es * U																										
Production Taxes	17	atx * PX * X																										
Value Added Taxes	18	vtx * PV * V																										
Sales Taxes	19	stx * PQ * Q																										
Import Tariffs	20	itm * ER * wpm * M																										
Enterprise Taxes	21								etx * PR_3																			
Income Taxes	22											ity * YH																
Educaion Capital	23																											
Health Capital	24														PK * Z_G													
Infrastructure Capital	25																											
Private Capital	26								chi * NPR_3			sr * (1 - rtx) * YH			GBAL + ER * (FL_G - $FL_{G\,1}$)													ER * (FL_3 - $FL_{3,-1}$)
Rest of the World	27	ER * wpm * M							I_3 * ER * FL_3						I_G * ER * FL_G													

[1] See Appendix A for a definition of the variables used in this table

Table B2
Mini-IMMPA data in SAM framework

		Accounts																									
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Rural Agricultural Sector	1	18 0	7 0	48 0	0 8					20 5	24 2	8 0	5 6	2 8													8 4	130 2
Urban Informal Sector	2	20 4	105 0	82 8	3 2					25 1	63 1	18 5	22 9	9 1														350 0
Urban Formal Sector	3	14 4	9 1 0	202 4	8 4					15 7	30 7	18 9	32 1	15 5										10 8	10 8	7	71 3	83 6	635 5
Urban Public Sector	4	1 2													53 8														55 0
Urban Unskilled Labor	5	52 0	109 2	28 5	9 8																								199 3
Urban Skilled Labor	6			37 0	32 8																								69 8
Profits	7	13 2	27 3	65 1																									105 6
Enterprises	8							63 1																					63 1
Rural Households	9					52 0		13 2							5 1														71 1
Urban Informal Households	10					109 2		27 3							0 0														136 5
Urban Formal Unskilled Households	11					38 3									14 0														51 2
Urban Formal Skilled Households	12						63 8								13 7														83 5
Capitalist Households	13								41 1						3 2														44 3
Current Government	14															53	-0 0	10 5	4 0	5 8 0	39 2	5 0	17 4					0	139 3
Export Taxes	15			5 3																									5 3
Employment Subsidies	16			-0 8																									-0 8
Production Taxes	17		10 3																										10 3
Value Added Taxes	18			4 8																									4 8
Sales Taxes	19			5 0																									5 0
Import Tariffs	20	12 0		27 2																									39 2
Enterprise Taxes	21								5 0																				5 0
Income Taxes	22									2 8	0 0	1 1	0 0	3 5															17 4
Educational Capital	23														10 6														10 6
Health Capital	24														10 6														10 6
Infrastructure Capital	25														14 7														14 7
Private Capital	26								12 5	7 1	16 5	6 8	15 0	11 5	0													0	71 3
Rest of the World	27	7 2		80 3					7 5						12 2														107 2
TOTAL	28	139 2	350 0	635 5	55 0	199 3	0 9 0	103 0	83 1	71 1	133 5	51 2	83 5	44 3	139 3	5 3	0 0	10 5	4 0	5 8 0	39 2	5 0	17 4	10 8	10 8	14 7	71 3	107 2	

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